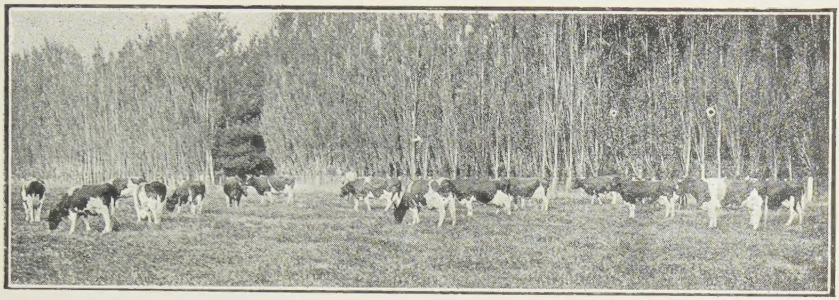

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THE GRASSLANDS OF NEW ZEALAND.

PRINCIPLES OF PASTURE ESTABLISHMENT.

(Continued.)

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TEMPORARY ELEMENTS IN PASTURE SOWINGS.

IN New Zealand at the present time it is the practice to sow down pastures with plants some of which will act as temporary elements giving rapidly produced feed soon after sowing, and others that are supposed to come on later to constitute the permanent elements. In other words, the one sowing is meant to serve a dual purpose to secure (1) a temporary pasture, followed by (2) a permanent one after the temporary elements have gone out. Apart from a rapidly establishing grass like Italian or Western Wolths rye-grass, the majority of our ploughed-land pastures are sown along with an annual crop, such as one of the cereals, which may be harvested, or with one or other of the stock-fattening crops such as rape or Thousand-headed kale. These plants are rapid to establish and may soon form a dense cover. In the last article of this series, dealing with temporary pastures, it was stated that the keynote of success in weed-control was to utilize some plant of use to the farmer which was more vigorous than the weeds with which he had to contend. That principle is essentially sound ; and if it holds good in the case of weed-suppression, how much more marked must be the depressing effect of these temporary elements

and of annual crops on the slowly establishing permanent-pasture plants that are sown along with them. Such cover-crops when utilized for stock-fattening are fed off in the leafy stage, but generally with regard to the cereals they are allowed to run to a full crop, which is harvested for grain or for chaff (Fig. 66). This practice of combining the sowing of a cereal crop to be harvested along with the grass is often adopted in all parts of the country, even where the rainfall is low and not at any time oversufficient for the successful establishment of the grass.

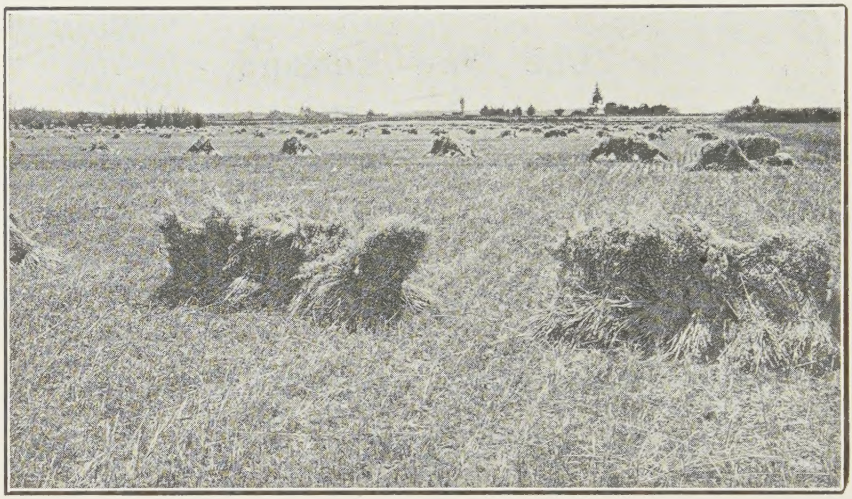


FIG. 66. CEREAL COVER-CROP HARVESTED FOR GRAIN.

Even under the most favourable climatic and soil conditions for the establishment of pasture good results could scarcely be expected from this practice.

REASONS FOR THE TEMPORARY COVER-CROP.

It may be said that the inclusion of too much temporary element in permanent-pasture sowings is imposing on Nature a task beyond the limits of her adaptability. The practice of the cover-crop, however, is one too widely adopted to be set aside lightly, or to be condemned without very careful consideration. Roughly speaking, the farmer has in mind any of the five following reasons for the combination of the temporary cover-crop, or "fillers," as these are sometimes called: (1) To act as a nurse-crop; (2) to provide feed rapidly; (3) to ensure some return from the land in case the grass should fail owing to erratic conditions of climate; (4) to represent a cash crop, the grass being included to avoid the necessity of ploughing up immediately the crop is harvested; and (5) to compete with weed-growth.

Nurse-crops.

It is often contended that under somewhat drastic climatic conditions the sowing of a quickly-establishing plant along with the grass is very desirable from the point of view of the protection such plants

afford to the more delicate and slower-establishing grass and clover. Hence has arisen the idea of such plants functioning as nurse-crops; and there is something in this contention where the area sown is of a loose sandy-natured soil and exposed to strong winds. Undoubtedly, in the establishment of pastures on such soils, quickly-establishing plants are necessary, and often it is impossible to establish grass on such country without their co-operation. Under no consideration, however, should such nurse-crops be harvested, but they should be fed off in a quite early stage. This phase will be considered more in detail when the grassing of sand areas is being dealt with in a future article.

The frequent success of red-clover establishment in a cereal cover is among one of the most weighty arguments used by the exponents of the cereal-cover practice, and it remains a fact that it is often possible to establish various kinds of clovers when some more or less open protection is afforded. Most clovers are slow to establish compared with grass, and this means that the clover content of an ordinary sowing may often be completely smothered out by the dense and rapid cover of the rye-grass in the initial stages of the pasture. Where a cereal crop is employed, however, the rye-grass develops much more feebly than it does without the cereal, and its inclination to tiller out is suppressed. Consequently, provided the cereal cover does not become too dense, there is really a more open bottom in the pasture, which is more favourable for the establishment of clover than is a dense sward of young grass, and thus the clover seedlings can persist (Fig. 67). When the cereal is removed the rye-grass is frequently too weak to recover rapidly, and the red clover gets away and provides an excellent clover pasture. It must, however, be firmly borne in mind that should the season be such as to cause luxuriant cereal growth the clover of such a sowing will invariably be smothered out. Many clovers are extremely fickle to establish in an ordinary sward of grass, and growers raising clovers for seed, where a pure stand is required, will often utilize the cereal as a nurse-crop to ensure the successful establishment of the clover—for example, with Lotus major and English trefoil. The successful white-clover crop often following in the stubble of cereals may also be explained on this theory.

Recognition that many clovers are slow to establish and cannot tolerate a dense sward of grass or other cover is very important, and fraught with many possibilities of improving the clover content of young pastures. True, however, as is the fact that clovers may be established successfully by the use of a cereal cover, grass differs very much in this respect. The seedlings become drawn up to the light, and tillering out at the base is inhibited, so that there results a spindly much-weakened plant. With grass it seems that a good start is everything, and very frequently if a pasture becomes stunted at its commencement it seldom develops into a good sward. Thus the nurse-crop practice is sound only under certain climatic conditions and for the establishment of certain clovers which are naturally slow to establish.

Provision of Early Feed.

The combination with the grass of a cereal or of rape for early feeding-off is, in general, asking too much of any soil, and for truly permanent pastures the practice should in no wise be entertained. It means that

FIG. 67. CEREAL COVER-CROP IN A SHORT-ROTATION PASTURE ALLOWED TO GET TOO FAR BEFORE FEEDING OFF.

The rye-grass is suppressed, but the clover is able to persist at this stage in the open bottom of the cereal cover.

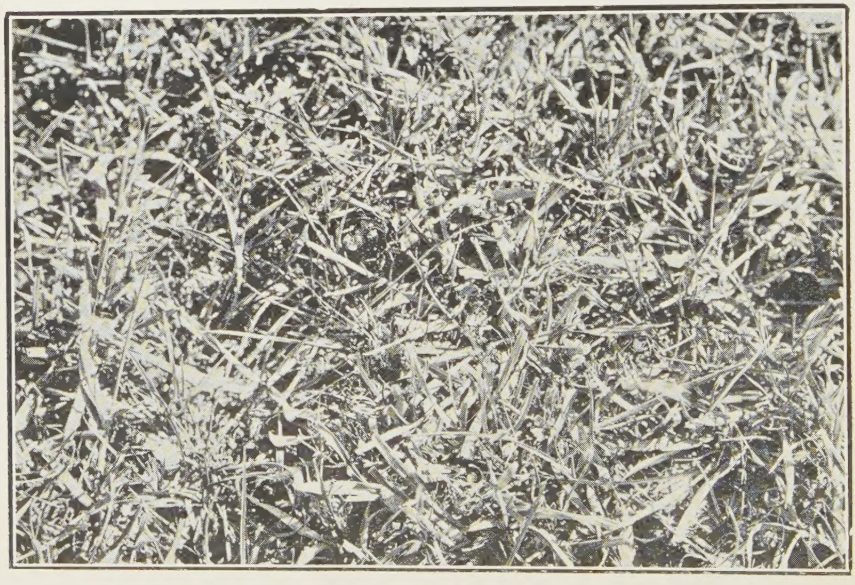


FIG. 68. CEREAL COVER-CROP IN A SHORT-ROTATION PASTURE GRAZED DOWN.

The rye-grass here is growing well in combination and forming with the cereal a closed turf.

either the slower-establishing species are going to be smothered out by the cereal, or, in the case of rape, tramped out in the feeding-off before they are well established. This does not mean that trampling with stock to a certain extent is not an excellent practice in the establishment of young grass, but frequently the cover of rape or cereal results in a too heavy stocking, which instead of being advantageous is decidedly detrimental. With short-course-rotation pastures, however, where perennial rye-grass is the main species used, this grass on good land establishes very rapidly, and is well advanced before the cereal or rape is ready to feed off, consequently little harm is done. Provided the cereal or rape is eaten down (Fig. 68) and not allowed to get away, this practice of the cereal or rape cover has the writer's advocacy, but only on the best of soils, where the immediately available food-supply is sufficient for the needs of the grass together with the cereal or the rape (Fig. 69). Where there is a shortage of available food the cereal, owing to its rapidity of starting off, will draw upon this food to the exhaustion of the grass (Fig. 70). Thus, on poorer soils, even though the climate may be wet, the resultant sward of grass may be considerably harmed by the cereal or the rape (Figs. 71 and 72), and under dry conditions the entire failure of the grass may result through the rape and cereal cover (Figs. 73 and 74).

In the establishment of permanent pastures, therefore, on no account should a cereal or rape be included in the sowing, but for short-rotation pastures on good soil they may be included with little visible harmful effect. On moderately poor land damage undoubtedly results to the ensuing sward of grass. The manurial effects of feeding off the cover-crop are certainly of very great benefit, but in the case of permanent pasture it would be a sounder practice to top-dress with artificials quite early in its development.

Ensuring some Return under Erratic Climatic Conditions.

In certain districts where the climatic conditions are erratic, and particularly with late spring sowings, the farmer would perhaps be well advised to include a cereal in case the conditions turn out unfavourable for the successful take of the grass; but once having sown, and favourable conditions having prevailed, it would be a much wiser course to feed off the cereal rather than allow it to run to a grain or chaff crop. This applies only to short-rotation rye-grass pastures.

The Cereal as a Cash Crop.

For the poorer short-rotation soils where cereal-growing for chaff or grain is a feature of the district the sowing-down with the cereal crop of a certain amount of rye-grass and red clover is quite justified, but the sward of grass which comes away after the cereal has been harvested can scarcely be called a pasture; rather is the grass that remains just about sufficient to warrant leaving the land unploughed for one or two more years. In other words, it is a method of extending the cereal-crop period, so that the land does not need ploughing every year. Such an extension is often very desirable, but the farmer adopting this practice can hardly be called a grassland farmer. On fairly good land under somewhat moist conditions, and when the cereal crop is rather light, there often results a fairly good take of grass in

FIG. 69. SHORT-ROTATION PASTURE SUCCESSFULLY ESTABLISHED ALONG WITH A COVER-CROP OF RAPE WHICH HAS BEEN FED OFF.

This is on first-class land, and quite a good sward of rye-grass has resulted.

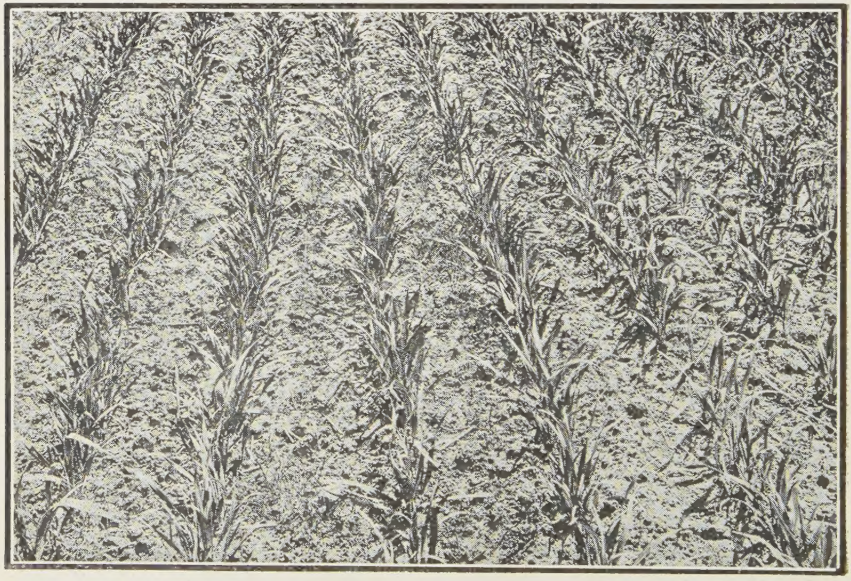


FIG. 70. CEREAL AND GRASS ESTABLISHING, SHOWING THE MARKED ADVANCE OF THE CEREAL OVER THE GRASS.

On any but the richest of soils the cereal must rob the grass of the food and moisture necessary for its successful establishment.

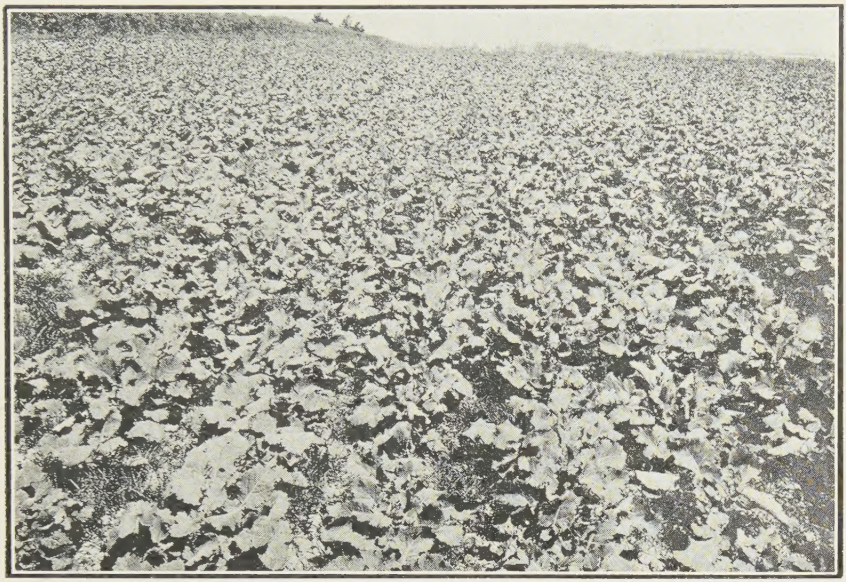


FIG. 71. SHORT-ROTATION PASTURE SOWN WITH COVER-CROP OF RAPE.

This is on land that is not quite first class, and undoubtedly the rape cover has been detrimental to the ensuing sward of grass (see Fig. 72).

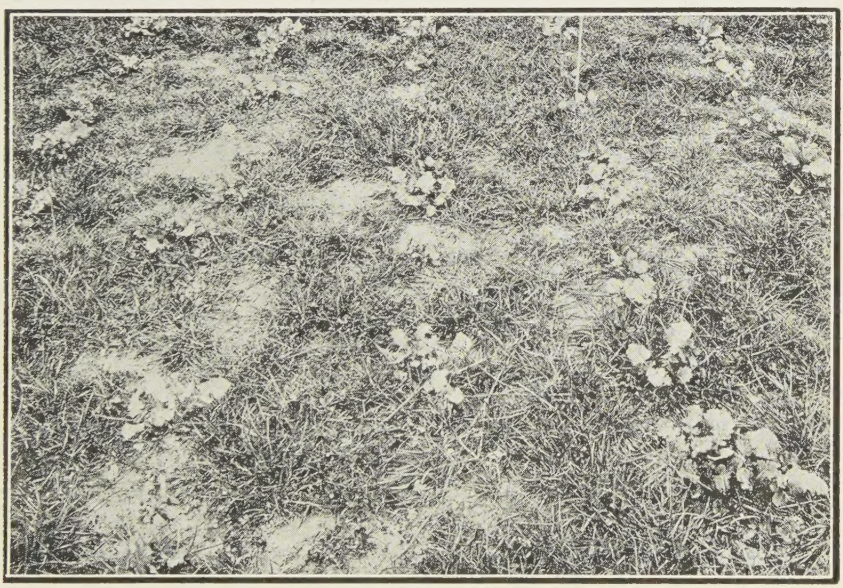


FIG. 72. PART OF THE ABOVE PASTURE PHOTOGRAPHED ABOUT SIX MONTHS LATER.

Note the numerous bare patches and the general thin open sole.

the second year after sowing; but this is only under very good conditions for grass-growth—on country, in fact, where cereal-growing is not general. Nevertheless, the practice is quite sound where a short course is being adopted, and if clover-seed-growing were also a feature of the farm this crop could well be worked in combination with the cereal—either wheat or oats. By sowing the clover-seed along with the spring-sown wheat, or at the spring cultivation of autumn-sown wheat, quite good stands of red clover can be successfully established. The practice, however, of sowing down permanent pasture for grazing in this manner does not appeal at all, and is manifestly unsound, because of the slowness with which the permanent elements of the pasture establish.

Another point in the sowing of grass along with a cereal crop that is to be harvested is that frequently the seed has to be sown too early in the spring to allow successful germination of many of the more permanent grasses. It is partly for this reason that the sowing of grass with rape, taking place as it does in late spring when the ground has become warm, has in many parts of New Zealand given much better results than sowing with oats. Perennial and Italian rye-grass, however, germinating as they do under a very wide range of temperature, are frequently successful when sown in early spring, while other grasses such as cocksfoot, crested dogstail, the poas, and meadow-foxtail may be complete failures.

PASTURE COMBINATIONS.

The question of pasture combinations is of extreme importance, and undoubtedly, even if we eliminate the cover-crop—cereal or rape—there are problems to solve which arise in studying the relation of the different grasses themselves and their reactions on one another when sown together. The quicker-establishing ones always have the better chance, and it is just this little extra advantage that makes all the difference. If cocksfoot were as rapid to establish as rye-grass the conflict would be fairly even, but undoubtedly cocksfoot is often suppressed by the rapid rye-grass cover.* The competition within a newly-sown pasture sward is intense, and the problem is, if possible, to so balance that competition that all the desired really permanent species have the necessary chance of development. It will be obvious that the inclusion of a large amount of rye-grass will upset the equilibrium of chances; and while, for various reasons, it is necessary to include a certain amount virtually in all pasture-sowings, yet its proper relation to the other species should be studied more and more.

This is well illustrated in Figs. 75 and 76. Fig. 75 shows approximately 1 square foot of turf of a permanent-pasture sowing in which all the constituents except cocksfoot have been removed. In all there were seventeen plants of cocksfoot per square foot, but the largest of them consisted merely of two or three slender shoots. Fig. 76 shows a pure-cocksfoot sowing, at 25 lb. per acre, in an adjoining field, in which the cocksfoot-plants are exactly the same age (approximately fifteen months) as those in Fig. 75. In this case the cocksfoot had no competition excepting of plants of its own kind, whereas in Fig. 75 it

* See "Cocksfoot: Its Establishment and Maintenance in Pastures," by A. H. Cockayne, in this *Journal* for May, 1919.

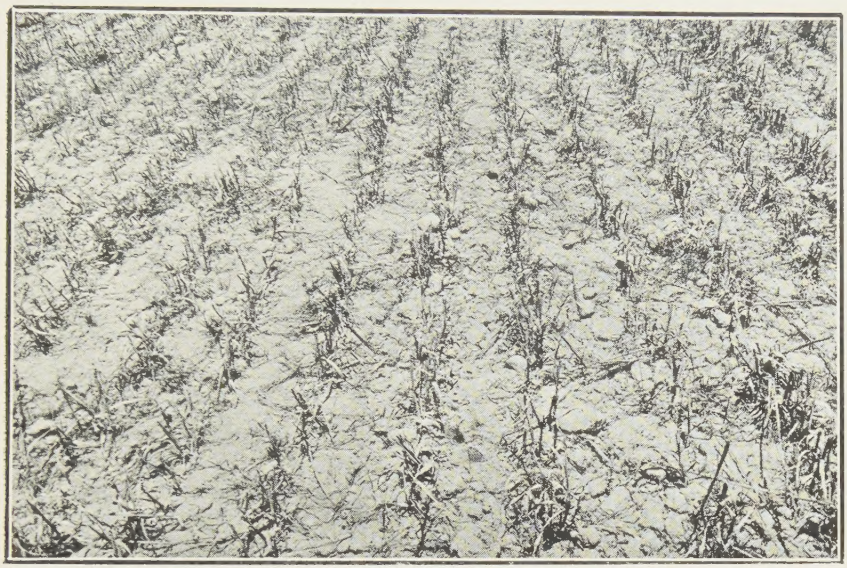


FIG. 73. SHOWING THE EFFECT OF A CEREAL CROP ON PASTURE-ESTABLISHMENT IN AN UNFAVOURABLE DRY SEASON.

All the grass and clover has been entirely killed out in the drier portions of the field.

FIG. 74. EFFECT OF A RAPE COVER ON PASTURE-ESTABLISHMENT IN AN UNFAVOURABLE DRY SEASON.

The rye-grass established fairly well, but was tramped out by the feeding-off of the rape, the surface baking hard through much treading.

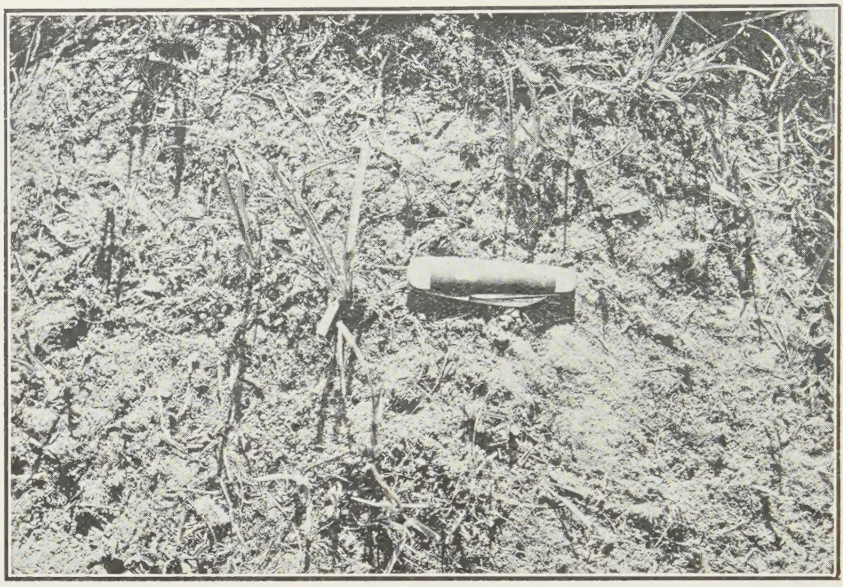


FIG. 75. SHOWING THE POOR DEVELOPMENT OF COCKSFOOT (IN FIFTEEN MONTHS) WHEN SOWN ALONG WITH MORE RAPIDLY ESTABLISHING SPECIES.

All the other constituents of the pasture have been removed from the area shown. Compare with Fig. 76.

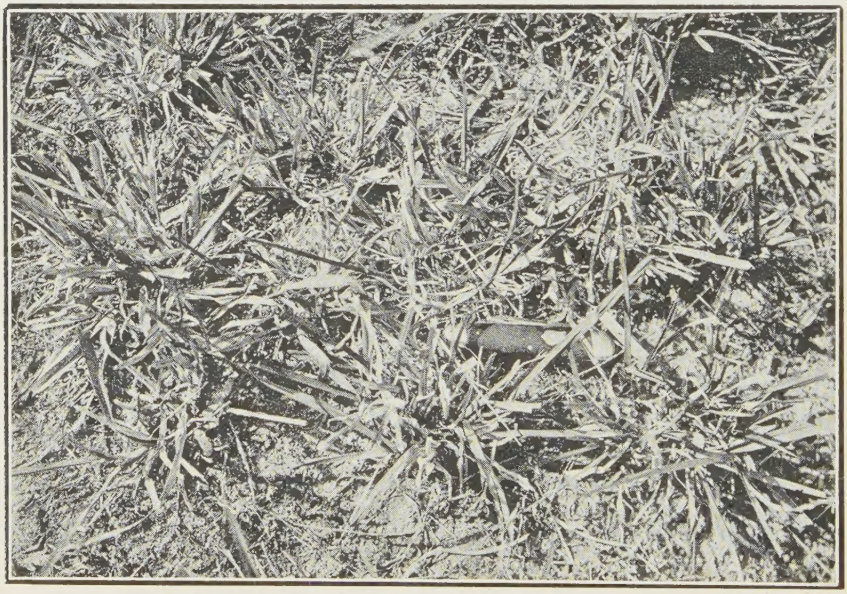


FIG. 76. DEVELOPMENT OF COCKSFOOT IN FIFTEEN MONTHS IN AN ADJOINING PADDOCK, BUT WHERE A PURE SOWING OF COCKSFOOT WAS MADE.

had been growing against a more vigorous rival in the form of rye-grass. Timothy, again, in combination with rye-grass does not make one-half the growth it does when sown as a pure sowing.

From the foregoing it will be recognized how important is the study and care of pastures in their early years of establishment, and particularly is this true of the permanent pastures. It would appear that sufficient evidence is forthcoming to indicate very clearly that the more or less dual-purpose sowing for the establishment of permanent pastures should be abandoned, and that a system should be adopted in which the temporary elements are sown by themselves in one field (*i.e.*, a temporary pasture if rapidly produced feed is required), while in another paddock a sowing mainly of truly permanent species is made. The temporary-pasture paddock would then function for the early feed, and the permanent one could be left unstocked, so that its component species might be given every chance to develop fully. As has been pointed out, however, in dealing with the transitional system of arriving at a permanent pasture (see pp. 200–202 of last April *Journal*), one should not make pure sowings of slowly establishing species. The same principle holds right through—namely, the conditions must be such that the necessary chance to develop is given to each species.

In most of the permanent-pasture mixtures recommended by the writer it will be noted that the temporary elements are considerably reduced compared with the ordinary pasture sowing used by farmers. If it were not for the fact that the farmer likes to see a rapid return for his money a more drastic reduction still could be made, with a corresponding increase of the permanent elements.

(To be continued.)

Ground Limestone.—With regard to the fineness to which limestone should be ground in order to produce the most economical results in agriculture, a great deal depends on (1) the conditions in the respective district, and (2) the state of the stone—hardness, composition, and accessibility—and the cost of power. The extreme view as to coarseness is perhaps that of Hopkins, who recommends the use of all the material which results on grinding a stone and will pass a $\frac{1}{4}$ in. sieve, and contains all the fine material which has resulted from the grinding. This quality of material would, no doubt, be supplied in the United States of America at a very cheap rate (a few shillings a ton) in bulk in 30-ton trucks. That such a coarse material would be valuable on New Zealand soils if obtainable cheaply enough is proved by various experiments carried out by the Department, notably those at the Wallaceville Laboratory Farm.

Export of Grass and Clover Seeds.—During the past year very considerable shipments were made up of Chewings fescue, rye-grass, crested dogstail, white clover, and red clover. With regard to the last four named, the dry European summer of 1921 caused a shortage there in these crops, and stocks that were held in New Zealand were exported at remunerative prices. The quality of the seed shipped was excellent, thus affording a good demonstration to English buyers of the capability of New Zealand in this branch of production. Following the Department's recommendations, good early deliveries of Chewings fescue were made to the United States market, which, if supplied at the right time, is capable of absorbing far larger quantities of this seed than are at present grown in the Dominion.

ASSOCIATION DAIRY-HERD-TESTING.

SUMMARY OF RESULTS FOR 1921–22 SEASON.

W. M. SINGLETON, Director of the Dairy Division.

THE present changed economic conditions as affecting the dairy industry are having an influence in the direction of causing a greater number of dairymen to become more closely interested in the production of their herds. This has been evidenced to some extent by a satisfactory increase in the number of dairy cows tested for yield of butterfat in the various herd-testing associations operating throughout the Dominion during the past year. In the 1921–22 season fifty associations have operated for which the testing and computing was controlled by officers of the Dairy Division. Of these associations the records for thirty-nine were computed at the headquarters of the Division in Wellington, while the remaining eleven had their records figured by the Farm Dairy Instructors attached to various dairy companies. It may be explained that a number of dairy companies have such Instructors in control of their farm dairy instruction and association testing work. These officers are appointed by the Dairy Division, while their salaries are very largely and in some cases entirely paid by the dairy companies for which they are working.

The following table affords a comparison of the testing operations carried out during the past season with those for 1920–21 :—

Table 1.—Summary of Testing Operations, 1920–21 and 1921–22.

	Associations with Records computed at Dairy Division's Headquarters.		Associations with Records computed by Farm Dairy Instructors.	
	1920–21.	1921–22.	1920–21.	1921–22.
Number of associations	33	39	8	11
Number of herds	433	602	233	299
Number of cows	9,349	13,347	6,131	7,740
Average number of herds per association	13	15	29	27
Average number of cows per herd ..	22	22	26	26

It will be seen that the totals show an increase of nine in the number of associations, of 235 in the number of herds tested, and of 5,607 in the number of cows whose yields have been computed by the Division's officers.

As was expected, the yield results for the past season show a considerable increase over those for 1920–21. While the latter season (1920–21) was only a fair one in regard to available feed, the season of 1921–22 may be classed as particularly good in this respect. The rainfall was fairly persistent right through the year, and cows were enabled by the plentiful supply of feed to keep in milk for a longer period than usual, also to maintain the quantity of their production. Much credit is also due to herd-improvement, which is in evidence in all the associations that have been running for two or more seasons.

For those associations with records figured in the Division's head office the average production of all cows in milk for 100 days and over was 239·64 lb. of butterfat in 230 days, as compared with 210·92 lb. in 218 days for the preceding season.

The summarized figures for the 1921–22 season are as follows :—

Table 2.—Averages of all Cows in Milk 100 Days and over. (39 Associations, 602 Herds, 13,347 Cows.)

Association No.	Number of Cows.	Association Average.		Highest Herd-yield in Association.		Lowest Herd-yield in Association.	
		Days.	Fat.	Days.	Fat.	Days.	Fat.
			lb.		lb.		lb.
1 ..	283	245	301·31	291	380·93	151	155·29
2 ..	683	207	192·29	279	327·47	119	85·04
3 ..	1,254	204	188·74	242	268·99	208	130·67
4 ..	658	226	219·58	257	309·29	117	112·38
5 ..	65	243	240·96	229	514·70	109	122·85
6 ..	77	210	251·57	248	372·03	214	210·67
7 ..	20	296	318·17	..	..	..	..
8 ..	386	241	237·88	298	335·44	131	167·55
9 ..	648	241	273·27	268	404·29	104	70·46
10 ..	202	225	260·14	273	404·22	122	128·27
11 ..	850	253	289·22	278	401·22	138	132·15
12 ..	649	246	276·80	273	398·03	110	91·62
13 ..	148	234	225·51	248	248·68	203	182·12
14 ..	317	257	275·25	275	334·56	129	112·51
15 ..	618	258	261·45	288	360·50	105	80·87
16 ..	239	255	296·33	241	329·01	152	202·92
17 ..	227	246	227·94	255	280·79	228	181·44
18 ..	197	246	266·73	271	356·27	102	95·80
19 ..	244	251	284·24	260	385·89	252	231·85
20 ..	203	234	238·44	262	289·83	119	155·88
21 ..	557	262	271·09	280	334·42	153	120·18
22 ..	124	239	276·82	254	298·95	177	222·09
23 ..	331	180	200·06	220	283·44	100	63·00
24 ..	525	201	208·58	252	318·82	120	86·84
25 ..	354	225	193·53	275	348·00	149	88·02
26 ..	644	230	214·48	272	317·52	103	66·25
27 ..	162	255	261·89	292	330·00	269	195·54
28 ..	406	212	215·70	240	330·80	132	73·93
29 ..	337	232	251·24	287	370·45	125	143·02
30 ..	172	160	168·43	216	267·96	122	87·75
31 ..	501	227	232·73	263	397·87	125	109·14
32 ..	168	166	168·43	177	236·39	175	129·71
33 ..	96	227	239·22	248	293·38	210	207·10
34 ..	221	258	306·38	276	362·13	218	249·18
35 ..	67	298	385·49	292	385·99	303	385·04
36 ..	66	237	248·61	217	262·24	244	226·32
37 ..	331	219	212·54	258	329·10	208	179·63
38 ..	183	224	251·05	262	309·57	113	123·76
39 ..	134	208	227·29	291	411·30	210	180·66

	Days.	Pounds Fat.
Grand average of all cows	230	239·64
Highest association average	298	385·49
Lowest association average	166	168·43
Highest individual herd	229	514·70
Lowest individual herd	100	63·00
Highest individual cow	326	760·72
Lowest individual cow	104	40·62
Average daily production of butterfat per cow ..		1·0421

Out of thirty-one associations running during the past two seasons the production of the average cow has shown an increase (in many cases very substantial), with the exception of one association, and in that case the decrease was due to the fact that testing was not supported as it should have been, and operations were closed down at an early date.

A comparison has been made of the herd results for those members testing during the past two seasons in the associations with records computed in the Division's head office. In all, 218 herds come into the comparison, and the average daily production of butterfat per cow works out as follows:—Season 1921–22 (5,101 cows), 1·05 lb.; season 1920–21 (4,956 cows), 0·94 lb.: percentage increase for 1921–22, 11·1.

For the associations with records computed by the Farm Dairy Instructors the production of the average cow milking 100 days or more has increased from 199·55 lb. of butterfat in 210 days for the season 1920–21 to 241·52 lb. in 230 days for the season 1921–22. The figures for the season 1921–22 are as follows:—

Table 3.—Average of all Cows in Milk 100 Days and over. (11 Associations, 299 Herds, 7,740 Cows.)

Association No.	Number of Cows.	Association Average.		Highest Herd-yield in Association.		Lowest Herd-yield in Association.	
		Days.	Fat.	Days.	Fat.	Days.	Fat.
			lb.		lb.		lb.
1 ..	1,420	243	281·31	271	428·97	196	220·43
2 ..	417	201	187·76	241	285·40	173	113·12
3 ..	1,367	239	268·65	286	354·72	150	159·78
4 ..	668	229	215·04	239	297·37	187	104·16
5 ..	1,208	202	158·05	266	279·01	187	95·85
6 ..	1,404	245	275·20	298	413·56	170	150·29
7 ..	350	239	269·62	280	366·03	190	157·52
8 ..	128	249	252·63	264	331·44	273	206·24
9 ..	345	229	221·77	247	273·40	178	146·41
10 ..	211	206	261·98	198	325·51	143	186·41
11 ..	222	202	202·29	233	304·40	187	92·85

	Days.	Pounds Fat.
Grand average of all cows	230	241·52
Highest association average	243	281·31
Lowest association average	202	158·05
Highest individual herd	271	428·97
Lowest individual herd	187	92·85
Highest individual cow	290	606·14
Lowest individual cow	121	51 50
Average daily production of butterfat per cow ..		1·0503

Combining the two preceding tables, it is shown that the average cow produced 240·33 lb. of butterfat in 230 days for the past season, as against 206·42 lb. in 215 days in the preceding season. Seeing that the average for season 1921–22 was based on results from 21,087 cows compared with 15,480 in the season 1920–21 the result is the more gratifying. Following are tabulated particulars:—

Table 4.—Average of all Cows in Milk 100 Days and over tested by Officers of the Dairy Division. (50 Associations, 901 Herds, 21,087 Cows.)

	Days.	Pounds Fat.
Grand average of all cows	230	240·33
Highest association average	298	385·49
Lowest association average	202	158·05
Highest individual herd	229	514·70
Lowest individual herd	100	63·00
Highest individual cow	326	760·72
Lowest individual cow	104	40·62
Average daily production of butterfat per cow ..		1·0451

For the 1921–22 season's operations of the associations with records computed at headquarters only, an average has been run out of all cows in milk 210 days and over. Particulars are as follows:—

Table 5.—Averages of all Cows in Milk 210 Days and Over. (39 Associations, 479 Herds, 9,101 Cows.)

Association No.	Number of Cows.	Association Average.		Highest Herd-yield in Association.		Lowest Herd-yield in Association.	
		Days.	Fat.	Days.	Fat.	Days.	Fat.
			lb.		lb.		lb.
1 ..	212	273	326·22	291	380·93	266	270·85
2 ..	363	245	226·52	279	327·47	243	156·16
3 ..	559	246	216·89	252	275·59	225	137·82
4 ..	423	260	246·70	269	340·48	218	171·41
5 ..	49	271	253·30	258	520·81	265	176·79
6 ..	41	239	298·37	253	380·18	234	238·70
7 ..	19	302	325·28	..	..	..	..
8 ..	294	264	253·51	298	335·44	276	233·46
9 ..	516	259	296·85	268	404·29	239	195·93
10 ..	132	261	303·58	273	404·22	232	241·08
11 ..	695	272	310·60	278	401·22	249	197·93
12 ..	514	265	299·67	273	398·03	255	211·00
13 ..	114	246	236·93	262	263·98	219	183·93
14 ..	280	272	289·95	284	340·45	254	223·32
15 ..	518	275	275·49	288	360·50	279	189·05
16 ..	206	266	309·30	249	340·43	259	268·19
17 ..	196	255	238·31	262	292·32	249	192·97
18 ..	174	264	286·99	271	356·27	236	242·63
19 ..	212	262	294·55	265	389·71	276	252·36
20 ..	160	255	257·23	262	289·83	221	189·91
21 ..	518	269	278·73	289	339·39	229	207·04
22 ..	102	253	287·33	257	299·61	228	155·93
23 ..	121	235	236·63	232	296·10	219	146·61
24 ..	242	243	256·94	265	338·94	233	164·94
25 ..	226	260	228·70	275	348·00	275	144·55
26 ..	422	268	249·61	286	334·62	252	158·59
27 ..	142	265	268·98	289	335·52	269	195·54
28 ..	225	251	255·23	250	359·85	254	176·91
29 ..	243	258	276·02	287	370·45	243	175·14
30 ..	20	229	260·40	231	269·14	214	250·41
31 ..	333	254	264·73	263	397·87	212	184·59
32 ..	16	232	199·15	224	238·98	238	151·33
33 ..	56	264	266·59	263	314·03	275	216·36
34 ..	209	263	311·46	276	362·13	223	259·19
35 ..	67	298	385·49	292	385·99	303	385·04
36 ..	56	249	258·06	230	278·74	244	226·32
37 ..	212	246	238·52	265	344·95	252	193·01
38 ..	140	249	276·23	264	321·12	225	196·83
39 ..	74	250	271·47	291	411·30	233	195·71

	Days.	Pounds Fat.
Grand average of all cows	261	271·48
Highest association average	298	385·49
Lowest association average	232	199·15
Highest individual herd	258	520·81
Lowest individual herd	225	137·82
Highest individual cow	326	760·72
Lowest individual cow	235	86·95
Average daily production of butterfat per cow ..		1·0420

This table excludes cases where cows have dropped out early in the season, not because they were drying off but because the member did not wish to continue further. For this reason the table perhaps indicates the production of the average cow somewhat more favourably than should be the case.

The foregoing figures show that officers of the Dairy Division tested and computed the records of 21,087 dairy cows. In addition there were some 4,825 cows tested for short periods by officers of the Division, and some 19,652 cows were tested in associations controlled by dairy companies for the benefit of their milk-suppliers. These numbers when aggregated give a total of approximately 45,564 cows tested, or about 4½ per cent. of the Dominion's dairy-cow population. While the remaining 95 per cent. gives ample scope for increase in testing in the future, there is some satisfaction in having included in the herd-testing associations a proportion of our dairy cattle which will compare creditably with that of any other dairying-country outside Europe.

ASSOCIATION COMPARED WITH CERTIFICATE-OF-RECORD TESTING.

A number of breeders testing purebred dairy cows under the certificate-of-record system are also members of some of the herd-testing associations. Their cows which are on certificate-of-record test have been on association test as well, in order that their records might be computed with the herd averages. Comparison of yields as between the two systems is always interesting. During the past season some thirty-one cows were so tested. The average yield on the certificate-of-record system was 339·04 lb. of butterfat; the association system showed a variation from these figures equivalent to 3·7 per cent. This small difference goes to show that the association milk-weights taken on the basis of two days in each thirty days are quite as accurate as is necessary for the yield-testing of crossbred or grade dairy herds.

Contagious Abortion.—At the Wallaceville Veterinary Laboratory during the last official year 194 samples of blood were received for serological tests for contagious abortion. Of these, 44 gave positive reaction, 144 were negative, and 6 were classified as doubtful.

Deficiency Disease in Stock.—A soil in the Manawatu district growing pasture upon which racehorse stock had developed osteoporosis was recently analysed in the Department's Chemical Laboratory. Compared with adjoining virgin land under small forest the only appreciable difference in composition which could be detected by the analysis was that the soil growing pasture contained 0·08 per cent. total phosphoric acid (0·016 and 0·019 per cent. available), whereas the adjoining forest soil contained 0·13 per cent. total and 0·036 available phosphoric acid. The pasture soil contained 0·08 per cent. total lime, whereas the forest soil contained 1·06 per cent.

LEAD POISONING OF STOCK.

A. R. YOUNG, M.R.C.V.S., Director of the Live-stock Division.

THE poisoning of stock by lead or one or other of its compounds is still so very common in New Zealand — in spite of the many warnings issued by this Division—that we find the death-rate from this cause upon the increase, instead of decreasing as might have been expected. When it is considered that except in isolated cases such poisoning could have been avoided, it is necessary to again direct the attention of stockowners to this matter.

The commonest form of lead-compound poisoning is by paint or red lead, portions of which have been left, after painting or repairing, within the reach of stock, it being no uncommon sight to see as much of these materials lying about after a new house has been built or an old one painted, or repairs effected upon farm equipment such as watering-troughs, as would poison a dozen animals. Sometimes travelling stock come across a rubbish-heap where all sorts of disused tins, tinfoil, &c., are thrown, and from this secure enough lead to cause very mysterious deaths about two or three days after and when miles away from the unsuspected source of supply. With pregnant animals abortion may result, and this is usually at once set down as due to contagion.

Lead poisoning may be acute or chronic. The latter form is rarely met with in animals, except in special cases where the poison has been absorbed in small quantities. It is the acute stage which comes mostly under our observation, and more especially where paint or red lead has been the medium. The source of the trouble may be most difficult to determine, for, unlike many other forms of poison, the poisonous properties of paint or red lead are not diminished by years of exposure. Thus it might so happen, and, indeed, has already frequently happened, that a farmer has been in occupation of a property for several years, during which period no repairs where paint or red lead has been used have been carried out, yet lead poisoning suddenly occurs. Then it may be discovered that a broken fence has allowed the animals to gain access to an orchard or some odd corner where the former owner had deposited disused paint-vessels still containing some of the material, as an easy means of disposing of them so that the lives of his stock would not be endangered. Or material which has been soiled with lead preparations may have been ploughed in, and again exposed in subsequent years, to bring about a mysterious mortality.

Symptoms: Symptoms of acute lead poisoning are as follows—The animal appears dull and listless, and does not appear to have any desire for food; the abdomen is tucked up, and there may be signs of colic. Diarrhoea is usually present, and the fæces very dark in colour. Stiffness or partial paralysis soon sets in, but the most prominent sign is a wild-looking staring eye not associated with any noticeable excitement. This is due to the unmistakable condition of the retina and partial or complete blindness, and it is not uncommon to see the animal walk up against an obstacle or into a ditch.

The chronic form is rarely met with in animals, and occurs where only small quantities of the poison are available. In such cases pregnant animals abort, emaciation takes place, and the coat is hard and dry. The abdomen is tucked up, and partial or complete paralysis supervenes. The blue-black line along the gums so characteristic of lead poisoning is developed, and death is brought about by general paralysis, specially affecting the heart.

Post-mortem appearances: Unless lead poisoning is suspected it is a very simple matter to overlook the real cause of death, which otherwise could reasonably be put down to gastro-enteritis caused by parasites. The person investigating, having eliminated factors which in his opinion could not have been the cause of death, must carefully look for even the smallest evidence, and as lead in its poisonous forms is not readily and totally absorbed there is generally sufficient evidence found in the stomach and intestines without resorting to analysis. As already indicated, gastro-enteritis is usually in evidence; but in every case the kidneys should be carefully examined, as almost invariably they show a granulated appearance.

Treatment: Where it is suspected that animals have partaken of paint or other such substance a generous dose of Epsom salts should be at once administered. The action of this agent is twofold—it acts by expelling the unabsorbed solids, and also, in conjunction with the solutions ready for absorption, forms a practically harmless insoluble compound. Flowers of sulphur has been recommended, as also lime-water, and where recovery is slow potassic iodide should be used.

Prevention: Deaths from lead poisoning could generally be prevented, because what the stockowner usually terms his bad luck is really his bad judgment. Greater care in the disposal of disused vessels which have been used to hold paint or red lead would result in a great saving in stock. The points to be remembered in this connection are that paint and red lead are articles in common use, that both retain their poisonous properties for many years, and that a very small quantity will cause death within two or three days; further, that if irregular, small quantities only are obtainable, a chronic condition is set up, which in the end may prove more expensive than if the animal had died in the early stages. It should also be borne in mind that, fortunately, one of the best remedies is one practically always available—that is, Epsom salts.

Institute of Horticulture.—The Hon. W. Nosworthy, Minister of Agriculture, has accepted the position of patron of the recently formed Institute of Horticulture.

Examination of Milk at Wallaceville Laboratory.—During the official year 1921–22 1,094 samples of milk, generally from cases of suspected contagious mastitis, were bacteriologically examined at the Department's Wallaceville Laboratory. Of these samples 294 were found to be from cases of specific infection, 242 from catarrhal mastitis (probably of staphylococcic origin), and 558 were found to be normal. 109 samples of milk were submitted to biological tests for presence of tuberculosis, but no reactions were recorded.

BROWN-ROT, SCLEROTINIA CINEREA SCHROET.*

ITS APPEARANCE, CAUSE, AND CONTROL.

G. H. CUNNINGHAM, Biological Laboratory, Wellington.

BROWN-ROT is the most serious of all fungous diseases occurring on stone-fruits. With the exception of Central Otago, where, apparently, it is unknown, brown-rot is common throughout New Zealand, occurring on apricots, cherries, nectarines, peaches, and plums.

As a rule it does not infect apples and pears, but occasionally it is found on these hosts. In such cases infection occurs through insect punctures or other skin-injury, the spores in all probability being carried to these injuries by insects, such as bees. That these are not natural hosts of the fungus in question appears to be evidenced by the behaviour of apple and pear fruits which have been artificially inoculated with conidia. Brown-rot appears in the flesh as the result of inoculation, and gradually spreads until in time the whole fruit becomes infected, when it turns quite black, fruits at this stage somewhat resembling those infected with black-rot. Few or no tufts of conidia are produced on the surface of such fruits, the behaviour of the organism differing from that shown on stone-fruits, where inoculation is followed by rapid rot, and the appearance of tufts of conidia on the surface of the fruit within a short time (thirty-six to forty-eight hours) after infection (Fig. 2).

Brown-rot is common in Australia, certain parts of North America, and on the Continent of Europe, where it is widely distributed. In Europe a brown-rot on pome fruits (apples, pears, and quinces) is known, which is destructive to these hosts, but causes little or no damage to stone-fruits. In New Zealand this disease, caused by a related species of fungus, *Sclerotinia fructigena* Schroet., fortunately does not occur.

ECONOMIC IMPORTANCE.

Until the year 1915 brown-rot was of comparatively little moment in New Zealand, but in the spring of that year great damage was caused both to blossoms and fruit. Since that date brown-rot has become the most destructive disease with which the grower of stone-fruits in this country has to contend. It attacks blossoms, shoots, leaves, and fruits, causing the death of blossoms, formation of cankers on the shoots, perforations in the leaves, and rotting of fruits. The effects of the disease are not limited to the orchard, as fruit commonly becomes infected during transit, and opens up in the market in a badly rotted condition.

Although blossom-infection is not often recognized, this condition usually being attributed to some other agency such as frost injury,

* Synonyms: *Monilia cinerea* Schroet. Blossom-blight; brown-rot canker; peach-rot; ripe-rot; twig-blight.

it causes a serious loss, as the infected blossoms are killed outright, and in cases of severe infection a tree may fail to set any fruit. The damage does not cease with the death of the blossoms, as the mycelium of the fungus frequently grows through the pedicel of the blossom into the shoot to which it is attached, and there forms small cankers, which may continue to enlarge until the shoot becomes girdled and dies, thus destroying tissue which should be available as fruiting-wood for the following season.

Leaf-infection is followed by the appearance of small, brown, more or less circular dead areas, which may later fall away, leaving perforations in the leaf similar to those caused by shot-hole (Fig. 1). In extreme cases the leaves are killed outright, when they usually fall to the ground. When fruits become infected complete rotting follows within a few days, the entire crop being sometimes lost in cases of severe infection, as those familiar with the disease have only too often observed.

Transit infection causes considerable loss, not only because a percentage of the fruit reaches the market in an unsaleable condition, but because in a season when brown-rot is prevalent the buyer is prepared to pay only a low price for fruit that may rot before being sold. Moreover, in order to safeguard himself against losses in the handling of infected fruit he is forced to charge a correspondingly higher price for all sound fruit sold. Increased price has its effect on the market, as it limits the quantity of fruit sold to those few able to pay the high retail prices that are demanded.

Summing up, brown-rot may reduce the crop by destruction of blossoms and mature fruits, or affect the following season's crop by partial defoliation of the tree or killing of laterals and branches, while its non-control seriously reduces the commercial value of the crop by lowering the wholesale price, and, again, limits the development of the stone-fruit industry by raising the retail price to a level that restricts consumption.

APPEARANCE AND EFFECT ON THE HOSTS.

As a rule brown-rot first appears on the blossoms; but this stage, being governed in its occurrence by atmospheric conditions, may be absent, though a wet season following a cold winter is usually followed by blossom-infection, which may become so general that the greater part of the crop is lost. Infection may occur before the petals unfold, or shortly after they have opened, the period of infection extending from the beginning of September to the last week in October, according to the time of flowering of the variety. Following infection the blossoms die and turn brown, the mycelium of the fungus then growing through the pedicel and entering the shoots at the base of the bud, where it forms a small canker. During its formation gumming occurs, the gum exuding on to the surface of the shoots, where it tends to adhere to the dead blossom and hold it to the lateral, with the result that the dead blossoms do not fall but persist where they have been killed, often for several weeks. Blossom-infection may occur in another manner, through the mycelium of the fungus spreading from the young lateral up the pedicel to the blossom. In such a case it would appear that the lateral has first become infected, forming at the

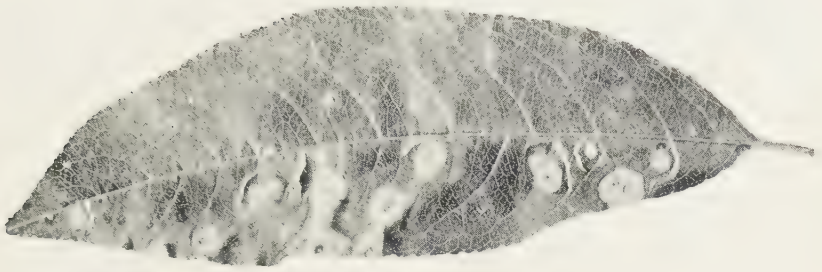


FIG. 1. LEAF-INFECTION: CIRCULAR DEAD AREAS HAVE BEEN KILLED BY BROWN-ROT FUNGUS. NATURAL SIZE.

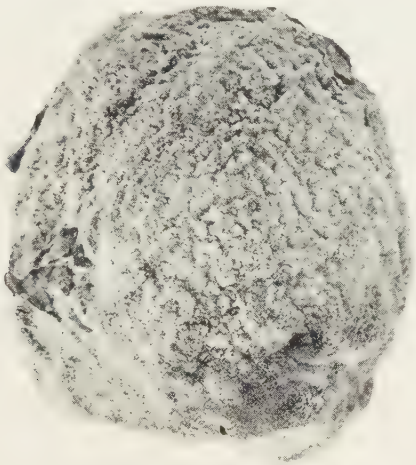


FIG. 2. FRUIT-INFECTION: MATURE PEACH-FRUIT COVERED WITH ASHY-GREY PUSTULES OF CONIDIA. NATURAL SIZE.

[*Photos by E. Bruce Levy.*

base of the bud a small canker from which the mycelium has spread to the blossom as described above. Following the formation of cankers on laterals the mycelium of the fungus may continue to extend until the whole shoot becomes girdled, when it rapidly wilts and dies. This condition is commoner at the time of the maturing of the fruit, and will be discussed more fully later. As a rule blossom-infection does not destroy all blossoms, but attacks a small percentage only. In exceptional cases, however, it has been known to kill outright all the blossoms.

Infection of the developing fruits may directly follow blossom-infection, but generally the disease does not manifest itself until about the time of maturity of the fruits. Fruit-infection first becomes noticeable from the presence on the epidermis of small, brown, more or less circular areas. These spots are not clearly defined in the early

stages from the healthy tissues, but as the rot progresses the outline becomes sharp, and about thirty hours after infection small, scattered, ashy-grey tufts of conidia appear upon the exterior of the infected areas. In from three to five days the fruit becomes discoloured and rotted throughout, the entire surface being covered with the numerous conidial tufts, which may at first be scattered but soon become so closely packed together that the whole fruit appears as if covered with an ashy-grey powder (Fig. 2).

The fungus may continue to grow down the fruit-pedicel into the lateral at the base of the bud, and form small cankers similar to those already discussed, from which it may extend along the shoot until it comes to a large branch. It may penetrate this and continue to develop until it ringbarks the branch, which suddenly wilts and dies. On such a branch gumming is conspicuous, but the most noticeable effect is the wilting and browning of the leaves, which remain on the tree after their death. Quite a large portion of the wood of a tree may be killed in this way, the destruction of branches, of course, lessening the following season's output. Moreover, cankers may persist in these branches for several seasons, and thus become an important source of infection each year.

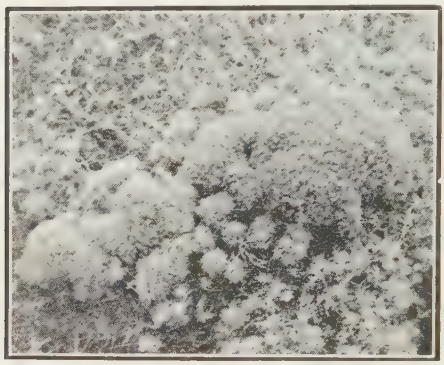


FIG. 3. CONIDIAL PUSTULES. × 10.
[*Photo by E. Bruce Levy.*

After a time infected fruits become somewhat hard in texture and wrinkled in appearance. The tissues being permeated with the mycelium, the fruit is now known as a "mummy." If the mummy persists on the tree until the following spring the mycelium within it is capable of producing conidia (or more correctly chlamydospores) throughout the winter, and of acting as a source of infection the following season. In fact, the mummy is usually covered with these spores. Should the mummies fall to the ground the mycelium after a time undergoes a slight change, becoming darker in colour. In short, sclerotia* are formed, from which, at blossoming-period, fructifications of another kind may be produced. These are described in detail later.

LIFE-HISTORY OF THE CAUSATIVE ORGANISM.

Brown-rot is caused by *Sclerotinia cinerea* Schroet., a fungus having two spore forms (conidia and ascospores) in its cycle. For many years the fungus was known only from the conidial stage, which was named *Monilia cinerea* Bon. In 1902, however, J. B. S. Norton discovered the perfect or ascigerous stage growing from mummified plums

* Literally, closely woven masses of hyphæ which act as resting-organs to tide the fungus over an unfavourable period.

in an American orchard. Until a few years ago this fungus was considered to be the same as that occurring on pip-fruits, but recent work on the part of W. A. Matheny (1913) and J. S. Cooley (1914) has shown that the organism on stone-fruits is quite distinct.

The disease may first appear at blossoming-time, when the opening blossoms become infected. Infection may be due to (1) ascospores produced from mummies lying on the ground, (2) conidia produced from mummies hanging on the trees, or (3) conidia produced from mycelium overwintering in cankers on the laterals or branches. Whether infection is from ascospores or from conidia the method of attack is the same, for should the spores alight on the petals or other parts of the flower, and abundant moisture be present, they germinate and produce a germ-tube, which rapidly penetrates into and kills the tissues. Within a few days tufts of conidia may be produced on the petals, &c., of infected flowers, and they may also appear on the

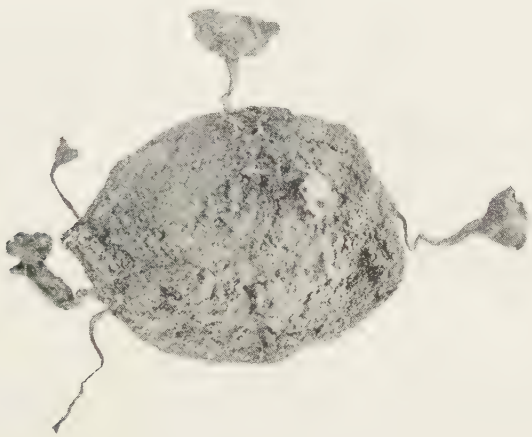


FIG. 4. APOTHECIA PRODUCED FROM SCLEROTIA CONTAINED WITHIN MUMMY OF FRUIT. NATURAL SIZE.

[*Photo by E. Bruce Levy.*

surface of the canker formed as the result of shoot-infection. Should they happen to be carried on to them conidia may in turn infect developing fruits in their vicinity. In an ordinary season, however, the disease does not again become prevalent until the fruits near maturity, though in a wet one fruit-infection may occur to a greater or less extent during the whole of the growing season.

As the fruits reach maturity the disease becomes noticeable, owing to the rapid manner in which they begin to rot. Infection at this stage may occur from conidia produced from mummies remaining on the tree, from conidia produced from cankers formed the previous season, or from conidia produced on blossoms and shoots as a result of blossom-infection. Ascospores, however, do not play a part in infection at this stage, as they are produced only at blossoming-time.

Whatever their origin, the conidia are carried on to the fruit by wind, insects, or even birds.*

Although infection most commonly takes place through wounds, it may occur wherever fruits are in contact (probably because moisture would be held at a point of contact for a longer period). In a wet season, however, infection may occur wherever the conidia happen to alight on the fruit. The conidia germinate in the presence of moisture

FIG. 5. SECTION THROUGH CONIDIAL PUSTULE ON FRUIT OF PEACH.

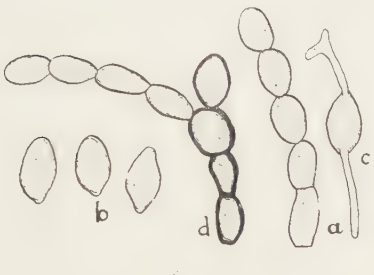
(*con*) Conidiophores; (*e*) epidermis (cuticle indicated by heavy line); (*h*) hair on epidermis of peach; (*sp*) conidia; (*st*) stroma. Note conidia lodged on surface between the surface hairs of the fruit. Camera lucida drawing. × 375.

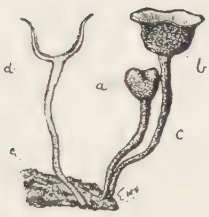
[*Original.*

and produce a germ-tube (hypha), which penetrates the epidermis and enters the tissues, beneath which it quickly grows and branches until quite a number of hyphæ are developed. These grow between the cells, killing them as they advance by the secretion of certain toxic substances. A closely woven mass of hyphæ (stroma) is soon formed (Fig. 5, *st*), and from this is given off upright hyphæ (conidiophores) (Fig. 5, *con*), which push through the now dead epidermis (Fig. 5, *e*), where they appear on the surface as small thread-like tufts. From the conidiophores conidia are produced. These are at first in chains (Fig. 5, *sp*), owing to the rapid method in which they are formed, but

* Mr. J. C. Neill informs me that at Weraroa a small bird, locally known as "silver-eye" or "white-eye" (*Zosterops lateralis* Latham), is the cause of widespread brown-rot infection. With their beaks the birds commonly pierce infected fruits, and turn from these to healthy fruits, especially those showing colour, such as nectarines, which in turn they puncture, probably with a view to ascertaining whether they are edible.

as they are only lightly attached to one another they soon become separated (Fig. 6, *c*), and appear as an ashy-grey powder upon the surface (Fig. 3). Conidia may be produced within thirty-six hours after infection, and in about four days the fruit may be completely rotted, so rapidly does the fungus develop. The hyphæ from which the conidiophores are produced continue to grow within the tissues of the fruit until the whole becomes permeated.





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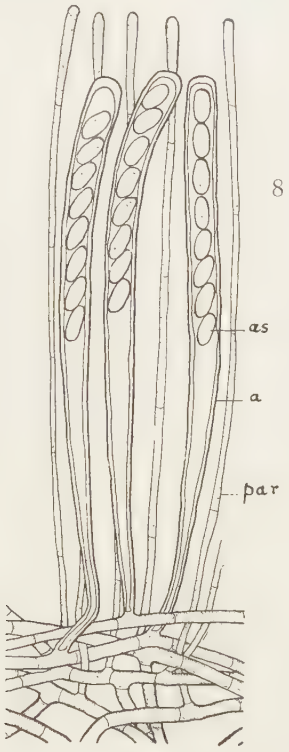

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FIG. 6. CONIDIA. × 500.

(*a*) Chain of thin-walled conidia; (*b*) free conidia; (*c*) germinating conidium, germ-tube protruding from each end; (*d*) chain of chlamydospores. Generally on germinating these produce chains of conidia. [*Original.*

FIG. 7. APOTHECIA. NATURAL SIZE.

(*a*) Immature; (*b*) mature apothecium; (*c*) stalk; (*d*) section; (*e*) portion of mummy. [*Drawn from nature by E. H. Atkinson.*

FIG. 8. SECTION THROUGH HYMENIUM. × 500.

(*a*) Asci; (*as*) ascospores; (*par*) paraphyses. Camera lucida drawing. [*Original.*

Infected fruits may remain on the tree until the following season, or they may fall to the ground. Should they remain, the mycelium may continue to produce conidia throughout the season. Conidia produced from these mummies during the winter months are slightly thicker-walled than those produced during the growing-period, and

are capable of remaining viable for several months, thus differing from summer conidia, which remain viable for quite a short time—six weeks or even less. These winter conidia are termed "chlamydospores" (Fig. 6, *b*). It must not be overlooked that the hyphæ of the fungus may grow through the pedicel into the lateral to which it is attached, and that it may continue down this until larger branches are reached; these may become girdled, and the whole branch in consequence be killed outright. This mycelium may persist for one or more seasons, and throughout the growing season give rise to conidia. This feature was very noticeable in 1915, and again during the past season, when laterals bearing mummies were commonly found to contain cankers.

Should the mummies fall to the ground they may for a time produce conidia, but in a short while the mycelium within them becomes darker in colour and more compacted, and forms sclerotia, which remain in a passive condition until the following season, when at blossoming-time they may give rise to apothecia. Should the mummies be buried more than 1 in. below the surface of the ground they are unable to produce apothecia; but such is the power of resistance of the contained sclerotia that mummies have been known to be buried for eight years and at the end of that time produce apothecia. The production of these bodies is governed by several factors. For example, weather conditions must be such that the fungus is stimulated into giving rise to them, and it would appear that a cold winter followed by a wet spring is most favourable for their development; they are produced *only during the blossoming-period*, and only when the mummy is lying on the ground or covered with about 1 in. or less of soil. That these facts have an important bearing on control will be seen later.

Apothecia* are saucer-shaped bodies borne on long stalks (Fig. 4), and are formed of closely woven hyphæ. The stalks grow from sclerotia embedded in the tissues of the mummies. The saucer-shaped portion is concave on its upper surface (Fig. 7), and the whole of this area is lined with asci (Fig. 8, *a*) and paraphyses (Fig. 8, *par*) arranged in a columnar mass, forming the hymenium or spore-bearing portion of the apothecium. The asci are long cylindrical sacs (Fig. 8, *a*), each containing eight colourless, one-celled ascospores (Fig. 8, *as*).

If conditions are humid the ascospores are ejected from the asci into the air, where they are caught and carried by air-currents to blossoms and young shoots in the vicinity. These may become infected and conidia be produced from the mycelium so developed, or the disease may be carried over the winter by mycelium embedded in the tissues of cankers formed the previous season, or by chlamydospores produced from mummies hanging on the tree.

ELIMINATION OF SOURCES OF INFECTION.

In order to enable brown-rot to be combated effectively it is necessary to destroy the sources of infection just described. Cutting out of cankered areas should present no difficulties, provided that

* An apothecium differs from a perithecium in being saucer-shaped and not flask-shaped, the hymenium being thus exposed as soon as the apothecium is mature. A drawing of a perithecium was contained in the article on black-spot published in last month's *Journal*.

pruning operations were carried out while the leaves were still on the trees, which would enable the dead shoots to be readily seen. Removal of infected fruits during the growing-period is advisable, in order to prevent shoot-infection. Destruction of mummies is a procedure that could also be carried out with ease, provided the mummies were those of peaches or apricots. In the case of cherries and plums the task would be a more difficult one owing to their small size. The only thing to do in such a case would be to remove the mummies from the trees during pruning, and plough them under prior to blossoming in the spring.

Another phase of control, and one commonly overlooked, consists in preventing contamination during picking, packing, and transit. The present system of handling fruit should be considerably modified, as at present fruits may become inoculated in many ways during picking and packing operations. The writer would suggest the following procedure, which may agree in general with the methods adopted by certain growers (that it is not a universal practice is obvious when many orchards are visited): Pick only those fruits which appear to be free from brown-rot lesions, and thus avoid contaminating healthy fruits with the hands or through contact with diseased ones. Pick into a box, or preferably a tin, instead of a picking-bag.* Once it has been filled place the tin out in the space between two rows of trees where it may be picked up and taken to the packing-shed. Contamination from the picking-bag is thus eliminated, the peaches stand less chance of being bruised, and a certain amount of time is saved. In the shed the fruits should be packed directly from the receptacles into which they were picked, and not dumped into a packing-bin, as is too commonly done. The writer has shown elsewhere that the second-hand case is a factor in transit infection, but if sterilization is carried out there is no reason why second-hand cases should not be used. At the end of the day the picking-tins should be sterilized, and stacked upside down until required.

Great care should be taken in the elimination, during picking, of all fruits infected with brown-rot; these should be left in the orchard, where they will be dealt with later. In packing, all fruits showing bruises or skin-injury of any kind should be rejected. These should be packed in separate cases, and where possible their sale should be limited to the nearest local market. It must be remembered that 75 per cent. of fruits in the market found to be infected with brown-rot show that infection has spread from skin-injury. All fruits intended for market should be wrapped in paper similar to that used for wrapping apples. This would prevent infection from external sources during transit, or from second-hand cases (thus rendering sterilization of these receptacles unnecessary), and would limit the spread of the disease within the case to those fruits which might develop brown-rot during transit. Moreover, wrapping would minimize skin-injuries and

* An excellent picking-tin is made as follows: Cut a side out of a benzine-tin, turning the edges down all round, with the short edges turned over *outside* the tin. At each end fasten a small wire handle to which, during picking, a broad strap passing around the shoulders is fastened with two spring clips.

would lessen bruising, as it is well known that wrapped fruits may be packed more compactly in the case.

CONTROL.

(By J. A. Campbell, Director of the Horticulture Division.)

It has been shown in the foregoing matter that brown-rot may be carried over in cankers formed on laterals and branches, and in mummies hanging on the trees and lying on the ground; furthermore, that infection is not confined to fruit hanging on the tree, but may occur during picking and packing operations, and even during transit, and subsequently in the market. As is well known, brown-rot is the most difficult of orchard diseases to combat, and it must be admitted that by spraying alone the disease will not be entirely held in check. This necessitates further action, particularly in the direction of minimizing infection by the destruction of mummies, cutting out of cankered shoots, and precautionary measures during harvesting and marketing. In short, successful control can be effective only when rigid orchard hygiene is carried out as a preliminary to spraying. If attention is paid to the cutting-out of all cankered shoots during pruning, to the destruction of all mummies, and to the elimination of infection during harvesting as previously set out, then it may be claimed that infection from brown-rot will be reduced to a minimum, if not entirely prevented.

Carry out pruning operations while the foliage is still on the trees, as at this time all cankers and dead shoots will be clearly seen. This does not necessitate any marked departure from ordinary orchard practice, as autumn pruning is often carried out at this time, notably in Central Otago.

Remove all mummies from the trees and from the ground and burn them or bury them deeply. Plough in the autumn, and dig under all portions beneath the trees not reached by the plough. Do not disturb the soil during blossoming, as it is at this period that ascospore-discharge occurs. As has been shown, apothecia are not formed if mummies are buried more than 1 in. below the surface. Thin heavily, and thus minimize the danger of infection at points of contact of the fruits.

During picking and packing handle the fruit as little as possible, cull all fruits showing skin-punctures, and be careful to throw out in the orchard any fruits showing signs of brown-rot. Wrap all fruits intended for sale, especially when the market is situated some distance from the orchard. Sterilize daily all picking-tins. It may be well asked whether infection would be prevented during transit by dipping the fruits in some fungicide, or by fumigation. It must be stated that numerous experiments along these lines have been carried out by the Horticulture Division, but so far without results that would justify our recommending this procedure.

Follow up the elimination of the sources of infection by spraying according to the following schedule. This will in large part eliminate infection by wind-borne or insect-borne spores which may be carried from adjoining orchards, and, furthermore, will prevent the production of conidia.

Spray Schedule for the Control of Brown-rot.

No.	Time of Application.	Spray.
1*	When buds begin to swell ..	5–4–50 bordeaux, or 1–15 lime-sulphur.
2	In early pink	1–50 lime-sulphur.
3	Petal-fall	1–120 lime-sulphur.
4	One month later	1–120 lime-sulphur.
5	When fruits are half-grown ..	1–120 lime-sulphur.
6	Just before fruits reach maturity..	1–120 lime-sulphur.

* This spray will also control leaf-curl.

Spray applications 1, 2, and 3 prevent blossom and shoot infection, and tend to stop the development of conidia which later may cause fruit-infection. Sprays 4, 5, and 6 provide developing fruits with an effective coating of fungicide, and thus tend to reduce fruit-infection. If weather conditions are abnormally wet at the time when the fruits are beginning to mature, the number of spray applications should be doubled.

To sterilize fruit-cases several methods of treatment are effective. Immerse cases for one minute in boiling water; or in copper-sulphate solution, 1–100; lime-sulphur solution, 1–50; or formalin solution, 1–40. The cases must be dry before any fruit is packed in them. Immerse tins for one minute in boiling water, lime-sulphur solution, or formalin solution. Do not treat tins with copper sulphate, as they will corrode.

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Gradings of Butter a d Cheese.—During the twelve months ended July, 1922, 1,010,956 cwt. of butter and 1,275,796 cwt. of cheese was graded by the Dairy Division. As compared with the preceding twelvemonth, butter shows an increase of 46·26 per cent., and cheese 14·21 per cent. Converted into butterfat equivalent the combined figures show an increase of 32·57 per cent. in butterfat production.

BOYS' AND GIRLS' AGRICULTURAL CLUBS.

THE TARANAKI AND WANGANUI EDUCATION DISTRICT COMPETITIONS: SEASON 1921–22.

J. W. DEEM, Fields Instructor, Department of Agriculture.

In the *Journal* for July, 1921, the writer gave an account of the south Taranaki agricultural club competitions, together with a brief history of their inauguration. During the past year the clubs in this part of the Dominion were extended, and now embrace north and central Taranaki, and the Brunswick, Wangaehu, and the Feilding districts. As previously the clubs were run under the auspices of the New Zealand Farmers' Union, assisted by officers of the Education and Agriculture Departments, the latter Department again providing seeds and manure free and issuing instructions for the guidance of competitors in the growing of their crops.

In north and south Taranaki the crops grown were mangolds and carrots, in central Taranaki swedes, and in the Brunswick, Wangaehu, and Feilding districts mangolds. Confirming the experience of last year, it was found that the swede competitions in central Taranaki were not very successful; the swede crop is too risky for children, and it should be replaced by something more reliable—a crop that will give competitors a fair run. In addition to the crop competitions, calf clubs were operated in south Taranaki. It was again found that the results achieved largely reflected the interest shown by the teachers and supervisors. Taking the competitions right through, the people interesting themselves in the work have reason to feel proud of the success achieved.

Altogether, forty-three schools in the Taranaki and eleven in the Wanganui Education District competed in the field-crop clubs, the figures being as follows: South Taranaki, 235 entries, of which 66 per cent. completed and had their crops judged; central Taranaki (swedes), 107 entries, 26 per cent. completed; north Taranaki, 210 entries, 53 per cent. completed; Brunswick, 22 entries, 82 per cent. completed; Wangaehu and Feilding, eighty-two entries, 72 per cent. completed. In the calf clubs eighteen schools competed with 207 entries, of which number 166, or 83 per cent., presented their calves for judging. Calf-judging was done in December, and field crops in April and May.

In addition to the judging in the field, displays of roots were made at the New Plymouth, Hawera, and Palmerston North winter shows, all three shows having classes for club members to compete in. At New Plymouth and Hawera the competition was keen, and a very fine collection of roots was brought together, these displays being quite a feature of the shows. Calves were also exhibited at the Egmont Agricultural and Pastoral Association's Show, at Hawera, in January last, special classes having been provided.

Although the percentage of failures is still large, the standard of work in cultivation and general attention shows a big improvement. In south Taranaki last year eighty-two crops of mangolds averaged 37 tons 13 cwt. per acre. In the same district this year eighty-eight crops averaged 59 tons, an average gain of 21 tons 7 cwt. per acre. In the same district last year the champion crop of mangolds weighed 77 tons 6 cwt. per acre. This year the champion crop weighed 152 tons 10 cwt. A girl—Dorothy Ward, of Okaiawa—was again the winner, and her sister, Erna Ward, was second with 141 tons 11 cwt. Both these crops gained full marks for cultivation, and were a sight to gladden the heart of any dairy-farmer. Last year, out of the eighty-two competitors in south Taranaki, ten gained full marks for cultivation. This year of eighty-eight competitors twenty-four gained the maximum points under this heading.

COMPETITORS IN THE MANGOLD COMPETITION AT BRUNSWICK.

In north Taranaki the champion crop of mangolds weighed 110 tons 11 cwt. per acre, and the average for sixty plots was 41½ tons. In carrots the best crop in south Taranaki was 72 tons, and the average for sixty-four crops 40 tons 10 cwt., while for north Taranaki the best crop weighed 54 tons 6 cwt., and the average for fifty crops was 30 tons per acre. In the Feilding district the best crop of mangolds weighed 60 tons 2 cwt., and the average for fifty-four crops was 32 tons 19 cwt. Brunswick's best crop weighed 82 tons 18 cwt., and the average for thirteen crops was 59 tons 2 cwt.

The record charts for south Taranaki, where the competitions have now been going for two years, also show a very decided improvement, indicating that the competitors are getting a more intelligent grasp of their work, and that they are realizing the value of care and accuracy in the keeping of records.

One very regrettable feature noticed by the judges was the number of plots destroyed by stock—in many cases within a few days of judging. This, naturally, is very discouraging to the child, who has probably done very good work. The carelessness shown by some parents in failing to take means to secure the plots against trespass by stock seems hard to understand.

In addition to the prizes provided by the Farmers' Union and winter-show authorities, several special prizes have been donated by private persons, and no doubt as the value of the movement becomes more generally recognized many other wellwishers will give financial as well as verbal support. There is no question that these competitions are going to do a great deal to create a love in our young people for farm life, probably more than even the most enthusiastic club supporters imagine. At present the clubs are only in their infancy, and many difficulties crop up, particularly in regard to finance, which at the present time is the main stumbling-block to getting the work on the best footing. Judging by the number of inquiries received this year there is every probability of the club movement being greatly extended in various parts of New Zealand during the coming season.

DERMATOMYCOSIS OF CATTLE.

A FUNGOID PARASITE OF THE SKIN.

H. A. REID, F.R.C.V.S., D.V.H., F.R.S.E., Officer in Charge, Veterinary Laboratory, Wallaceville.

CASES of skin-disease of an unusual nature occurring among cattle in the Dominion have recently come under observation. The first case appears to have been seen in 1918. The subject was a bullock, in which the disease had so far advanced as to render treatment of very doubtful value. This animal was destroyed on account of its deplorable condition. No investigation into the cause appears to have been made. About eighteen months later further cases were reported occurring among the same herd, which I had the opportunity of seeing. Six bulls in a herd of thirty-two were found to be affected with a chronic dermatitis, which had evidently commenced as a localized infection on the loins and spread thence to the sides, abdomen, and legs. A six-months-old calf was also slightly affected. The lesions were peculiar and had probably been present for some considerable time. Recently a further case in the same district, but in a different herd, has been observed.

In the original outbreak investigated the following observations were noted. When first observed the disease had already advanced to a chronic stage characterized by a greatly thickened appearance of the skin, which had become covered with thick horny scabs. These were easily detached in some places, and firmly adherent to the subjacent tissues in others. Removal of the scab exposed a moist,

inflamed base, with a sticky, greyish, exudate exhaling a sour, musty odour. No great amount of irritation appeared to be caused by the trouble. The affected animals did not respond to scratching, and removal of the scabs caused obvious pain. The only sign of discomfort was an occasional lashing of the tail as though to dislodge flies, though in the cold weather of late autumn none were about. Affected animals had lost condition slightly, and in the worst affected the temperature registered 103·4° F.

On my next visit, some weeks later, a heifer had been found on the run very badly affected. Her appearance was extraordinary. Almost the whole body seemed to be covered with the thick, greyish scabs, which in some places had become heaped up, projecting ½ in. to 1 in. above the body-surface. These lesions were present inside the ears, around the orbits, the nostrils, thighs, and abdomen, giving the animal the aspect from a short distance of being coated with thick mud, and recalling the appearance commonly seen in severe cases of ringworm. The heifer was in poor condition, and the body exhaled a putrid odour. She was destroyed, and I secured specimens from the skin, and also scabs from the affected bulls, which were collected into a sterile test-tube.

Microscopic examination of the skin-exudate revealed the presence of a mould mycelium collected here and there in thick, felted masses. Numerous staphylococci were also present, though the necrosis bacillus which it was thought might be implicated could not be determined.

Experimental inoculation of calves by the process of rubbing some of the scabby material into the skin, with and without previous scarification, led to infection with the disease. On the fifth day after inoculation the skin was seen to be inflamed, and the commencing eruption could be distinctly felt. Two days later the condition had become well marked. The skin was rough and scabby, the scabs being firmly adherent. The hair over the inoculated surfaces had not been shed. In ten days' time typical lesions had occurred. The skin felt greasy. It was tender and painful when touched, and the characteristic sour, musty odour was easily noticeable. The scabs could now be detached. Microscopic examination exhibited the same appearance noted in the original cases, except that the mould was not quite so luxuriant. Other smaller animals—rabbits, guinea-pigs, and fowls—proved refractory to any form of inoculation.

Ordinary methods of culture from the material collected from the skin produced a rapid growth of staphylococci. Special methods of cultivation for the isolation of the mould were undertaken. After seven days' incubation in the dark, at room temperature, the mould had started to grow out from the edges of the scabs in a very striking manner. Inoculations from this culture were made on to plates of acid agar and gelatine. The agar plates after twelve hours' incubation at 37° C. developed a white mould consisting of a mycelium of branching, septate hyphæ, showing chlamydospores. Comparison with the pathogenic moulds classified in Coupin's "Atlas des Champignons Parasites et Pathogènes de l'Homme et des Animaux" showed the isolated mould to correspond with that of *Epidermophyton gallinae* (Megnin)—a fungus which causes favus of birds, and is also inoculable to rabbits, mice, and the human subject, though not to rats. Dogs and cats are said to be

susceptible, and to a lesser degree horses. Favus of man is alleged to be transmissible to cattle, though, so far as I can gather, naturally occurring cases in bovines have not been recorded. Experimental test inoculation, however, proved that the mould could not be *Epidermophyton gallinae*, unless some modification it had undergone, due to artificial culture, had rendered it innocuous to the species generally attacked.

Tr atment of the cases, even in the chronic stages, with warm $2\frac{1}{2}$-per-cent. creolin solution in water, though tedious, proved eventually effectual. The protection afforded the organism by the thick scabs made it difficult for the dressings to penetrate. It is advisable to wash and even scrub the skin with warm water and soap in order to soften and detach the scabs before applying the solution.

A feature of the disease which requires explanation is the situation of the lesions on the loins, which appear to be the predilection seat of infection in naturally occurring cases. It is probable that the broad, level, surface provides an ideal place for the spores to rest. The disease does not appear to be very contagious, judging by the few animals affected in a herd kept under identical conditions. The complaint is evidently more prevalent in the late autumn, the humid atmosphere no doubt favouring the growth and development of the fungus.

Shortly after the compilation of the foregoing notes cases similar to those described were reported from Northern Rhodesia by Mr. H. E. Hornby, M.R.C.V.S.* Mr. Hornby describes a condition affecting the skin of cattle beasts, characterized by the formation of crusts and thick scabs commencing on the loins and gradually extending to other parts of the body. The disease in Rhodesia occurs during the rainy season, the warm, humid climate at this season favouring the growth and propagation of the infective agent. In these instances also a fungus appears to be the cause, to which the name *Dermatophilus congolensis* has been given. The treatment recommended by Mr. Hornby consists of the application of Cooper's milk-oil fluid, not weaker than 1–30. Solitary lesions are dressed by picking off the crust and applying the undiluted milk-oil fluid. When the disease is localized the application is used in a strength of 1–10 or 1–20. When the disease has spread over the body the milk-oil fluid is used diluted to 1–30, but only a quarter to half the body-surface is dressed at one time, according to the extent of raw surface exposed by removing the scabs. By these means, Mr. Hornby concludes, "all but the worst cases can be cured, especially if, a fortnight after the first dressing, all unhealed lesions receive a second and stronger application of the medicament."

Probably the treatment suggested would be found equally serviceable in cases of a similar nature occurring in New Zealand.

* "A Contagious Impetigo of Cattle," H. E. Hornby, M.R.C.V.S., D.V.S., Northern Rhodesia. The *Veterinary Journal*, Vol. 76, June, 1920.

Hop-growing.—The area devoted to commercial hop-growing in New Zealand last season was approximately 700 acres, practically the whole being in the Nelson District. During the official year 1921–22, 2,056 cwt. of hops, valued at £18,054, was exported.

PHOSPHATIC FERTILIZERS IN NEW ZEALAND AGRICULTURE.

THE NAURU AND OCEAN ISLAND SUPPLIES.

A. F. ELLIS, New Zealand Phosphate Commissioner.

[Paper read at the annual conference of the New Zealand Council of Agriculture, Wellington, July, 1922.]

THE benefits arising from using phosphatic fertilizers on our New Zealand soils have been so fully demonstrated from time to time that the fact hardly requires stressing. It will generally be agreed that under most of our agricultural conditions the farmer cannot afford to put in crops without them, and in many districts top-dressing is equally necessary. It is evident that phosphoric acid is the limiting factor as regards our capacity of production, and fortunately such fertilizers are cheaper and more lasting in their effects than nitrogenous or potassic manures. The action of phosphoric acid on plant-growth has been dealt with fully from time to time by competent authorities, and hardly calls for further reference. Its great service in bringing on the growth of legumes, with their wonderful property of absorbing nitrogen from the atmosphere and storing it up in the roots, for the benefit of grasses and other crops, is now fully recognized. Probably this is one of the most important factors in the beneficial results obtained from top-dressing our grasslands.

VARIOUS FORMS OF PHOSPHATE.

The fact that phosphatic fertilizers are supplied in three different degrees of solubility, however, calls for some comment. A good deal of misconception exists in this matter, and one frequently hears of the less suitable fertilizer being selected for certain purposes. To put this matter in a concise form, and avoiding confusing technical terms, the following appear to be the general characteristics and conditions under which the various phosphatic fertilizers should be used:—

Water-soluble phosphate: The only form this is applied in is the well-known article superphosphate, the quickest in action of all phosphates, and particularly adapted for cropping, by reason of the way the young plant is helped on. Its wonderful effect on root-development and in hastening the maturity of the crop leaves it without a rival in these respects. Where soils are more or less acid, particularly when the super is used for top-dressing, it is advisable to use lime also, as this fertilizer is an acid one.

Citrate-soluble phosphate: This is usually supplied in the form of basic superphosphate, basic slag, and finely ground raw phosphate. Of these, basic superphosphate may be considered the quickest in action, and as regards percentage of phosphoric acid is somewhat higher than high-grade basic slag. Being an alkaline fertilizer it can be used with advantage on acid soils, and many authorities hold that it is the best article to use for top-dressing, particularly where the

rainfall is not very high. Basic slag if prepared under the Bessemer process of manufacturing steel is fairly quick, and gives good results; but this process has been superseded in England and some other countries by the "open-hearth" method, which yields a much lower quality of slag both as regards percentage of phosphoric acid and citrate solubility. Some of this "open-hearth" slag is coming into the Dominion, and care should be taken to make sure that it will compare favourably with other citrate-soluble phosphates as regards results. In any case, even high-grade basic slag contains less than half the percentage of phosphoric acid that finely ground Nauru phosphate does. In the latter a smaller percentage of the phosphoric acid is citrate-soluble, and this has led to much misconception as regards its utility. The analytical process of estimating citrate-soluble phosphate was first introduced as being the nearest approach to what actually takes place in the soil when a phosphatic fertilizer is applied, and it was therefore considered an authoritative test as to the manurial value of the fertilizer. But of late years it is becoming discredited in this respect, and it has been demonstrated repeatedly by field tests that phosphates not highly citrate-soluble but high in phosphoric-acid content have given as good and frequently better results than a fertilizer containing more citrate-soluble phosphate but a lower total phosphoric acid. The reasons for this are not difficult to arrive at. Many of our New Zealand soils are more or less acid, and this acidity is the main factor which renders the phosphate available for the plant, thus doing in slow degrees what the sulphuric acid does rapidly in the process of manufacturing superphosphate. The phosphate, while taking up the acids of the soil, at the same time counteracts the acidity to a considerable extent, in the same way that lime does, and thus further assists towards establishing fertility. Recent experience in the Auckland Province has demonstrated the effect of soil-acidity on raw phosphate very forcibly. It has been found that when mixed with finely ground limestone the phosphate has not given such good results. The reason is that the lime neutralized the soil-acidity forthwith, thus counteracting the conditions which would have rendered the phosphate more readily available to the plant. The best test, therefore, for citrate-solubility is the actual use of the fertilizer in the ground, for the chemist cannot produce in the laboratory the same conditions that prevail in the soil.

Insoluble phosphate: This term is misleading, for though tricalcic phosphate is insoluble so far as pure water is concerned, when applied to the soil it encounters different conditions. The soil-waters contain carbon dioxide and organic acids, which slowly but surely act on the phosphate. The principal phosphatic fertilizers in this class are finely ground Nauru, basic slag, and bonedust, though the value of the last-named is enhanced by its percentage of nitrogen. Phosphatic fertilizers containing a high percentage of insoluble or tricalcic phosphate can be used to best advantage for top-dressing on acid soils, particularly in districts where there is a good rainfall. The latter factor is a very important one. Without the rainfall the phosphate may lie for some time practically inert in the soil, but of course the process of rendering it available starts as soon as rain sets in. Soils which are rich in humus or decomposed organic matter respond readily to this class of fertilizer. As these so-called insoluble phosphates are slowly soluble, the benefit

from using them extends over three to four seasons, so that for permanent improvement to grasslands they may be considered quite suitable. It is very necessary that the material should be ground to a very fine state of division, at least 80 per cent. passing through the standard sieve of 100 holes to the linear inch. These fertilizers should be applied preferably in the late autumn or winter, in which case the plant has a longer period to draw its requirements of phosphoric acid before the spring conditions set in. If applied in the spring when immediate action is necessary, this can be obtained by adding a proportion of superphosphate—say, one part of super to two of finely ground Nauru. This mixture is very useful in many ways, and may be used for cropping purposes, as well as top-dressing. The water-soluble phosphate gives a quick start to the young plant, and as it matures the less soluble phosphate can be dealt with.

It will be seen from the foregoing that Nauru and Ocean Island phosphate is capable of supplying all requirements as regards phosphatic fertilizers. If a quick-acting phosphate is required, superphosphate is most suitable. If an alkaline fertilizer suitable for top-dressing any soils and safe for cropping even on acid soils is needed, basic superphosphate is most suitable. If permanent benefit to grasslands is wanted, and provided there is a good rainfall, finely ground Nauru, with its 84 per cent. of tricalcic phosphate, may be expected to give good results, particularly if the soil is more or less acid and has a good percentage of humus. Finely ground Nauru will supply phosphoric acid cheaper than any other form of phosphatic fertilizer without exception; and though there is some adverse comment from sellers of other fertilizers as to its solubility, there is little doubt but that all the phosphoric acid will be available for the plant within four years' time. In the manufacture of superphosphate and basic superphosphate the high quality of Nauru and Ocean Island phosphate leaves it without a rival, and at the present time practically all of those fertilizers used in the Dominion are manufactured from the deposits on the two islands. Owing to its high grade, superphosphate containing 45 per cent. water-soluble phosphate is placed on this market. In England the usual grade of super is 30 per cent., and the saving in freight and handling charges to the Dominion farmer by using an article containing half as much again phosphoric acid is obvious. In districts where railway and other transport charges are high and roads bad it is of particular importance to use the highest-grade fertilizers. With regard to the finely ground Nauru it has a competitor in basic slag, for which there is a considerable demand, notwithstanding the fact that experiments conducted in certain localities under the supervision of the Department of Agriculture have demonstrated that results obtained from finely ground Nauru, even in the first year, are ahead of those obtained from basic slag. The fact that Nauru contains more than twice as much phosphoric acid compared with even high-grade basic slag leads one to confidently expect that in the second, third, and fourth years after application Nauru will still be ahead. That, of course, remains to be seen, and the results which the Department will supply in due course will be eagerly looked for.

The question of price is naturally of vital importance. In England basic slag, being a by-product, is sold to the farmers at less than half the price obtained there for finely ground Nauru. Naturally its use is

strongly advocated, and undoubtedly it is a cheap form of phosphoric-acid supply in that country. But in New Zealand the position is reversed, as basic slag costs more than finely ground Nauru, even though it contains less than half the percentage of phosphoric acid. The prices of the two articles as being retailed on the Auckland market compare as follows: Basic slag—18 per cent. P_2O_5 (equal to nearly 40 per cent. tricalcic phosphate), at £6 10s. per ton; cost per unit of tricalcic phosphate, 3s. 3d. Nauru phosphate—84 per cent., at £5 17s. 6d. per ton; cost per unit of tricalcic phosphate, 1s. 5d. The difference in favour of Nauru is therefore 1s. 10d. per unit, or, on a percentage of 84 per cent. tricalcic phosphate, £7 14s. per ton.

It may be taken as a general rule that where basic slag gives good results finely ground Nauru will also be successful, as similar soil and rainfall conditions are suitable for both. It appears, therefore, that if through inadequate rainfall or lack of humus in the soil satisfactory results are not obtained from the finely ground Nauru in certain localities, it would point to the advisability of using the more soluble phosphate for top-dressing—basic superphosphate.

Some other competitors with finely ground Nauru in the New Zealand market are several Island phosphates, ranging from about 30 per cent. to 65 per cent. tricalcic phosphate. Though these are of low quality, several thousand tons are imported annually. The article supplied from one of these islands is so low in tricalcic phosphate that one ton of Nauru is equivalent to about three tons of the other.

NEW ZEALAND'S QUOTA OF NAURU PHOSPHATE: NEED FOR SUPPORT BY OUR FARMERS.

Under the terms of the Nauru Agreement the United Kingdom and Australia are each entitled to 42 per cent. of the output of phosphate from Nauru and Ocean Islands, the New Zealand quota being 16 per cent. During the first eighteen months under Government ownership, 554,656 tons of phosphate were shipped from the Islands and distributed as follows: Australia, 357,496 tons; United Kingdom, 32,300 tons; New Zealand, 29,750 tons; other countries, 135,110 tons. The very low proportion used in this Dominion is to some extent accounted for by the fact that the various fertilizer-manufacturers at that time had outstanding contracts with other suppliers for their requirements of rock phosphate. For 1922 New Zealand is doing much better, and about 45,000 tons will be used here as against 21,626 tons for last year. But we are still far behind our 16 per cent. quota, which on an output of 400,000 tons per annum from the two islands would amount to 64,000 tons, and this quantity would be readily absorbed here if it were not for the fact that the Dominion has unfortunately become a dumping-ground for much lower grade phosphates from outside sources. The sale of these reduces the demand for the high-grade article from Nauru and Ocean Islands, thereby reducing the output from those two islands and retarding further reductions in our selling-prices. If the New Zealand farmers were to use only the various fertilizers prepared from Nauru and Ocean Island phosphate, whether in the form of superphosphate, basic superphosphate, finely ground raw phosphate, or a mixture of the first and last named, they would not only be using the highest-grade fertilizers obtainable, but they would be helping materially in bringing about

further reductions in selling-prices. This applies not only to the working-costs at Nauru and Ocean Islands, and other overhead expenses, but also to the fertilizer-works in the Dominion, which are mostly new and quite up-to-date. They are working on Nauru and Ocean Island phosphate now, and only require a big turnover to reduce their working-costs to a minimum.

There is another important aspect of the case which should not be lost sight of. Under the terms of the Nauru Agreement, while the Dominion is entitled to 16 per cent. of the output, the proportions allotted to each country are to be readjusted at the end of each five years, in accordance with the quantity used during that period. Should we fail to use our 16 per cent. quota during the first five years—and we have already fallen behind a great deal in the first two years of the currency of the Agreement—the Dominion would be entitled only to a correspondingly reduced quantity for the subsequent period of five years. There are three years left in which we can make up our deficit, but failing this New Zealand would not be entitled to 16 per cent. of the output, as is the case at present. The world's consumption of superphosphate doubled in the ten years preceding the war, and it may be expected that the same increased demand will take place here. If through using large quantities of low-grade phosphate from outside sources this country loses its right to an adequate proportion of the Nauru/Ocean Island output, it will be realized when too late that a very serious mistake has been made. There is sufficient of this wonderfully rich phosphate on the two islands to last several generations, and owing to their proximity to the Dominion, if it is more generally used, it will be possible to place the material on this market at low prices. But that will avail nothing if our farmers, through apathy or shortsightedness, allow the right to an adequate proportion of the output to be lost. The remedy is obvious—use the Dominion's phosphate, prepared at works within the Dominion, and no other. That is the safe policy leading up to a reliable supply of highest-quality fertilizers obtainable at lowest prices.

While this arrangement regarding the readjustment of the proportion allotted to the three countries would work adversely in the event of the full quota not being used in New Zealand, on the other hand it would work to our advantage if, as might reasonably be expected, the Dominion took more than 16 per cent. when it is available, which at present is the case. In all probability in a few years the Dominion's consumption of high-grade phosphate will be 100,000 tons per annum, for we may confidently expect a continuation of closer settlement, resulting in the taking-up of many of our idle second-class lands, which only require cheap phosphate and railway facilities to transform them into prosperous dairy farms. Under the terms of the Nauru Agreement it would be possible to get 100,000 tons per annum, and even more, without paying any further sums towards the capital invested in the business, but it can be arrived at only if the Dominion farmers wholeheartedly confine their fertilizer purchases to Nauru phosphate, whether in the form of superphosphate, basic superphosphate, finely ground raw phosphate, or a mixture of the first and last. Our Government went into the Nauru arrangement at the express wish of the agricultural interests of the Dominion. It assures the supply of the highest-grade phosphate for this and future generations,

but it is necessary for farmers to abide loyally by that arrangement, otherwise other countries and not New Zealand will be the ones to reap the benefit.

The Dominion having invested nearly £600,000 in the Nauru and Ocean Island phosphate deposits, it is natural that some tangible benefit is looked for from the investment. In this connection it was stated recently in the Press that Australian farmers have already effected savings to the extent of about £2,000,000 by using Nauru and Ocean Island phosphate since the business was purchased by the three Governments. This highly satisfactory result has been effected because in Australia the merits of a high-grade article are fully recognized, and there is practically no demand for any other phosphate. For the first twelve months under Government control Australia took no less than 265,000 tons from Nauru and Ocean Islands. In New Zealand the principal benefit to the farmers has arisen from the tangible reductions already made in the prices of phosphatic fertilizers since 1st July, 1920, when the business was taken over by the three Governments. At that time super was retailed at £8 10s. and finely ground raw phosphate at £9 12s. 6d. in the Auckland market, while the retail prices now are £6 and £5 17s. 6d. respectively. The Commissioners responsible for the working of the deposits expect to make further reductions in the price at which they sell to the countries concerned, but this depends on the output obtainable from the two islands. To work them economically they must export 400,000 tons per annum, and up to the present this has not been possible, owing to the fact that in the present state of the fertilizer market this quantity of high-grade phosphate cannot be sold.

PROGRESS OF OPERATIONS AT NAURU AND OCEAN ISLANDS.

The industry at Nauru and Ocean Islands has now been under Government control, through the Board of Commissioners, for just over two years, and it may be of interest to touch briefly on the progress of operations there since the change of ownership. The best test of efficiency is naturally the amount of phosphate exported per annum, though the weather and other local conditions have a certain bearing on the subject. During last year a total of 394,000 tons was shipped from the two islands. The best previous year when the Pacific Phosphate Company owned the business was 1913, when nearly 339,000 tons was shipped. This record has therefore been broken by about 55,000 tons. A record day's work at shipping was recently put up at Nauru when 2,189 tons was shipped to the "Delungra." This quantity was all lightered in surf-boats carrying about 3 tons, which have to be towed off to the vessels by oil-launches. These instances of efficiency at the islands afford evidence that the work can be done, so far as the islands are concerned. As a matter of fact, the steamers are loaded much faster than they are discharged in New Zealand, which is good evidence as to the need of improved methods of handling the material here.

Since coming under Government ownership, up to the 30th June last the total shipments from the two islands, the amounts taken by the three countries interested, and their respective percentages, are as follows :—

	Tons.	Percentage taken.	Percentage under Nauru Agreement.
Australia	437,200	60·2	42·0
New Zealand	55,600	7·7	16·0
United Kingdom	32,300	4·4	42·0
Other countries	200,810	27·7	..
	725,910	100·0	100·0

This year it is apparent that shipments will be considerably lower than last year, as the Commissioners are experiencing more difficulty in selling the output, owing to the slump in the fertilizer trade in the United Kingdom, the Continent of Europe, and Japan. For this reason we have repeatedly been without steamers at the islands, and on two occasions our storage-bins were so full that the phosphate-raising and artificial-drying operations were brought to a standstill. It is hardly necessary to point out how adversely this acts on our working-costs, and particularly when the business has to pay interest on the large capital invested by the three Governments.

With a view towards further reducing our working-costs in various ways, and strengthening the position at the islands, the Commissioners are now calling for tenders for the erection of a modern shipping plant at Nauru, on the cantilever and rubber-belt conveyer principle. This would dispense with the present laborious and costly system of lightering, and would permit of shipping at the rate of 500 tons per hour, thus loading a 6,000-ton steamer in a day. The erection of this plant will probably take two or three years. When it is operating, and the production of phosphate is up to, say, 500,000 tons per annum, the effect on selling-prices to the countries concerned will be very satisfactory. While this cantilever is the main development under consideration, other material improvements are being made, the principal one so far being the purchase of a new steamer for the trade. She is named the "Nauru Chief," and is now on her way out from England via Panama, and is due at the islands towards the end of next month. She will be particularly suitable for doing the difficult work in connection with the deep-sea moorings at the islands, and for recruiting labour. Some good passenger accommodation has been installed for the benefit of the considerable number of passengers who travel between the islands and Australia, and also cold-storage chambers for the carriage of frozen meat, &c., to the islands. The vessel will carry about 3,750 tons of phosphate, and will thus be profitable as a freight-earning proposition, while her other conveniences will render her of great value to the business.

CONCLUSION.

In conclusion, I may say that the Nauru and Ocean Island phosphate industry under Government control is progressing satisfactorily, but, as the New Zealand representative on the Board of Commissioners, I consider it is my duty to point out that this Dominion is not receiving so full a benefit from the investment as might otherwise be the case, and its future interests are being prejudiced, because the New Zealand farmers are not fully acquainted with the position. The remedy, as has been already stated, is in the farmers' hands, and it is earnestly recommended that the matter should receive attention with a view of improving the position.

MARTON EXPERIMENTAL AREA.

OPERATIONS FOR SEASON 1921–22.

J. W. DEEM, Fields Instructor.

THE spring of 1921 gave promise of being early, but anticipations were not fulfilled, and some of the crops suffered from heavy rains and were partly drowned out. The weather during early harvesting was fair, but owing to changeable conditions ensuing some difficulty was experienced in harvesting the later-maturing crops. However, eventually all the crops were saved in good condition, although in the case of peas a proportion was lost through the continual turning to get them dry.

The crops grown consisted of 9 acres of Algerian oats, 10½ acres of wheat (four varieties), 5 acres of barley, 8½ acres peas (five varieties), 2½ acres of vetches, 1 acre of broad-leafed Essex rape, 1 acre of Japanese millet, 1 acre of Sudan grass, ½ acre of Soya beans, and ¾ acre of linseed. An area of ¼ acre of swedes (thirteen varieties) was tested for disease-resistance.

Oats.—The Algerian oats were sown on 6th and 7th May, 1921, and were harvested early in January, 1922, and cut into chaff. They were grown chiefly for feeding the farm horses. The 9 acres yielded 15 tons of chaff, or at the rate of 1·6 tons per acre.

Wheats.—The varieties of wheat sown were John Brown, Currawa, Marquis, Major, and Marshal Foch. The two first-mentioned varieties were sown on 5th September, 1921, and the remaining varieties on the following day. The Marshal Foch seed, which had only just been received from England, failed to germinate, and the ground was resown with Major on 28th September. All varieties, with the exception of the late-sown Major, matured very evenly. The respective harvesting dates and yields were as follows :—

Variety.	Date of Harvesting.	Yield per Acre of Good Grain.	Yield per Acre, including Seconds.
		Bushels.	Bushels.
John Brown	20th January ..	22·6	24
Marquis	31st January ..	31·1	32·5
Currawa	27th January ..	29·3	32
Major	31st January ..	37·3	39·3
Major (late sown)	8th February ..	48·3	51·6

Average over the whole area, 33·6 bushels of good grain, or 37·7 bushels including seconds.

Major wheat, which gave the heaviest yield in this test, has come greatly into favour in the Rangitikei district during the past couple of seasons, and some very fine yields have been secured, several being in the vicinity of 70 bushels per acre. From information collected it is ascertained that this season from 393 acres of Major an average yield of 51 bushels per acre was obtained, while in the case of John Brown the average from 272 acres was 33·2 bushels per acre.

Barley.—Five acres of black skinless barley was sown on 12th November and harvested on the 14th February. The yield was 28·8 bushels per acre. This is low when compared with the two previous years (41¼ bushels in the season 1920–21, and 48 bushels in 1919–20), but the crop suffered severely from heavy rains just after being sown. Black skinless barley maintains its reputation for quick maturity on this coast, and it is a noteworthy fact that for the past three seasons the crop at the Marton area has taken just three months from the time of sowing until it was ready to cut.

Peas.—The varieties of peas grown consisted of Arthur, Canadian Field, Grey Partridge, Early Minto, and the grass-pea. The two first-mentioned varieties were sown on 7th October, 1921, and the remainder on 8th October. The Arthur pea matured quickest, and was cut on 7th February, just four months from the date of sowing; Early Minto was cut on 20th February, Canadian Field on 21st February, Grey Partridge on 6th March, and the grass-pea on 12th March. Owing to wet weather the three varieties cut first were in the field a considerable time before they could be stacked, and the continual turning to get them dry caused a large percentage of the Arthur and Canadian Field varieties to drop, this being the reason for the yield per acre being somewhat low. The Early Minto peas, although they received similar handling, did not leave the pods nearly so readily. The yields per acre in bushels were as follows: Early Minto, 40; Grey Partridge, 38·3; Canadian Field, 18·5; Arthur, 15; grass-pea, 20·6. In each case the sample of seed secured is very good.

Vetches.—An area of 1½ acres of Scotch vetches yielded 22·2 bushels per acre. The seed has been dressed, and is a first-class sample. A good number of vetches dropped during harvesting, and after the crop was got off the ground the area was disked, and there is now rather a good crop of self-sown vetches. These have already been fed off once with sheep.

Roots.—Thirteen varieties of swedes, including some new varieties, were tested for disease-resistance, but not one stood out as disease-resistant. They were all more or less attacked by club-root and dry-rot.

Feeding-tests.—The following crops were grown for use in feeding-tests: 1 acre broad-leafed Essex rape, 1 acre peas (Arthur, Canadian Field, and Imperial Blue, mixed), 1 acre vetches and oats, 1 acre Japanese millet, and 1 acre Sudan grass. Only ¾ acre of each of the two last-mentioned crops was fed, and both were fed together. The millet and Sudan grass were poor crops, due to their being partly drowned out a couple of days after being sown. Fifteen lambs with an average weight of 56·9 lb. per head were weighed on to the vetches on 19th January, and twenty-three with an average weight of 56·9 lb. on to the Japanese millet and Sudan grass on 28th January. On 11th February both lots were weighed. Those on the vetches showed a total gain of 196·5 lb. (average 13·1 lb. per head) after twenty-three days' feeding, while those on the millet and Sudan grass showed a total gain of 170·2 lb. (average 7·4 lb.) after fourteen days' feeding. After weighing, both lots were again placed on their respective crops and weighed again on 6th March. At this weighing the lambs on the vetches had put on a further 0·4 lb. each, making a total gain of 13·5 lb. per head, or 202·5 lb. for the fifteen lambs in forty-six days. Those

on the millet and Sudan grass had put on a further 9·1 lb., making a total gain of 16·5 lb. per head, or 379·5 lb. for the twenty-three lambs in thirty-seven days.

In connection with this test it should be mentioned that the vetches were finished at least three days before the lambs were finally weighed, but the weighing could not be done at the correct time owing to wet weather, and consequently the lambs went back slightly in weight. With reference to the Japanese millet and Sudan grass, the lambs ate the Sudan grass right out before commencing on the millet. It is very evident that they preferred the former to the latter, but at the same time it would appear that the millet has better fattening properties than the Sudan grass. The millet lasted right up to the date of final weighing. It should be mentioned that all lambs were penned up for fifteen hours before each weighing.

Haying-pasture.—Five acres of temporary pasture—Italian rye-grass and red clover in its fourth year—was closed up early in October, 1921, and cut for hay on 19th December, being saved in good condition. The whole area had been limed with 10 cwt. per acre of carbonate of lime at the end of the previous July, and a portion top-dressed with 2 cwt. per acre of superphosphate on 23rd September. Prior to cutting several average areas were weighed, and those from the portion that had lime only averaged 11 tons 8 cwt. per acre of green material, while the weighings from the portion that had also received superphosphate averaged 14 tons 15 cwt.—a difference of 3 tons 7 cwt. in favour of the manured area. After the field had been cut it was again closed up, and was cut for hay for the second time on 13th February. At this cutting the portion which had lime only averaged 5 tons 15 cwt. per acre of green material, while the portion that had superphosphate in addition to the lime averaged 6 tons 8 cwt. The average over the whole field for the first cutting was 11 tons 14 cwt. of green material, and for the second cutting 6 tons 2 cwt. The hay has been pressed, and weighed thirty bales to the ton. On this basis the first cutting yielded 2·9 tons hay per acre and the second 1·5 tons, while for the season the field yielded 4·4 tons hay per acre. The field also carried an average of 2·8 sheep per acre for the year.

Lucerne.—The two acres of lucerne was cut four times during the year, and gave the following total weights of green material per acre :—

Old area (sown 18/12/18) : Marlborough variety—Broadcast, 25 tons 10 cwt. ; 7 in. drills, 19 tons 14 cwt. ; 14 in. drills, 22 tons 12 cwt. ; 21 in. drills, 21 tons 9 cwt.

New area (sown 19/12/19) in 21 in. drills : Grimm variety, with manure, 16 tons 12 cwt. ; without manure, 14 tons 12 cwt. Marlborough, with manure, 13 tons 17 cwt. ; without manure, 14 tons 12 cwt.

Branding Registration Districts.—By Order in Council gazetted on the 22nd June the existing Buller branding registration district was abolished, two new branding districts being constituted in its place, as follows : A new Buller district, with registration office at Hokitika, comprising the counties of Buller and Murchison, and including all boroughs and town districts in or adjacent to that area ; and a Golden Bay district, with registration office at Nelson, comprising the counties of Takaka and Collingwood, and including all boroughs and town districts adjacent to that area.

FEEDS AND FEEDING FOR PIGS.

HINTS FOR ORDINARY FARMING CONDITIONS.

K. W. GORRINGE, Instructor in Swine Husbandry, Live-stock Division.

DAIRY BY-PRODUCTS.

THE food most commonly used in New Zealand for pig-feeding consists in dairy by-products—skim-milk, buttermilk, and whey. Skim-milk and buttermilk are about equal in food-value, but whey as received from the dairy factory to-day, with the fat residue taken out, is worth only about one-third of skim-milk. It is not generally recognized by the average farmer what a valuable food he has in dairy by-products, not only from the actual feed-value, but in imparting to the carcase a quality which is not obtained when such products are left out of the ration. Skim-milk and buttermilk are recognized as nearly a balanced ration. They form ideal diets for very young pigs when still on the sow or newly weaned, and until they are three to four months old, on account of the protein and carbohydrate contents being nicely balanced. As the animals increase in age, however, the carbohydrates should be increased also. This is done by the addition of grains, either whole or in the form of meal.

In general practice the farmer feeds as much skim-milk, buttermilk, or whey as the pigs will consume. This is a mistake (though one which the feeder is not usually aware of), as it has been proved conclusively that dairy-products should not be fed alone, but in conjunction with something else, if the best results are to be obtained. The feeder in the past has been wasting a valuable material, which could have been put to much better advantage had he been aware of this.

Comparing the analyses of skim-milk, buttermilk, and whey, a very large difference is found in the protein content. Whereas skim-milk and buttermilk show 3·6 and 3·4 per cent. respectively, whey shows only 0·8 per cent.; while in the carbohydrate contents a point or two only covers the difference. It is thus easy to see why farmers in whey-feeding districts have a difficulty in getting their young pigs to come away and grow quickly—the material which promotes growth and helps to build up the frame is present in such small quantities in whey. Some feeders realize the importance of adding something to the whey, and it generally ends in the purchase of some meal with a high carbohydrate content. What is required, however, is a food containing a very high protein content, and this can be obtained by using meat-meal, blood-meal, or linseed-meal, or by allowing the pigs to graze as much pasture or forage crops as they wish. Some pastures and crops are very rich in their protein content, this being very little below that of skim-milk.

It is advisable to mention here that many troubles may arise in the piggery from the injudicious use of these milk by-products. Overfeeding is one which farmers often do not consider, and it is most important. Keeping the trough filled all day is a bad practice; the animal should have only what it will clean up at feeding-time. If allowed to sip and sip all day indigestion and constipation are likely to occur, and from

these many other ailments may follow. Dairy-products should be fed fresh and in a sweet condition. Skim-milk should be given a few hours after being separated, this allowing any gases to escape. A good practice is to feed in the morning what has been separated at night, and *vice versa*. Avoid the practice of some feeders who allow the skim-milk to remain in the tubs or barrels for two or three days, and then feed it in a hard, curdy, sour condition. This is looking for trouble, for not only is there the danger of germ infection from the barrels, but most of the rheumatic ailments among pigs have also been traced to the feeding of sour milk. Always feed whey as fresh as possible; there is danger of it fermenting, which may cause serious trouble.

SUGGESTED ARRANGEMENT FOR PIG CROPPING AND GRAZING AREA—1½ ACRES.

Each of the smaller divisions (which may be kept in grass) is occupied by a light, movable pig-house. The larger divisions can be used for growing any suitable forage crops; one might be kept in lucerne. The fencing between the smaller divisions—indicated by broken lines—is temporary. Shelter-trees or hedging can be planted along the permanent fence-lines if desired.

FORAGE CROPS.

For using dairy by-products to the best advantage the farmer should try and balance the ration as far as practicable by the growing of various forage crops suitable to local conditions. The farmer who provides forage crops for his pigs whenever possible is the one who stands to make the most profit. Green forage is essential to the economical production of pork. If the farmer, instead of making his dairy-products the maintenance ration, would adopt forage crops for grazing as the first ration, and use his milk foods as a supplementary one, he would find that not only has he healthier and more robust animals, but that the milk foods will go twice as far and allow him to keep nearly double the number of pigs.

The system of the grazing of forage crops and pasture by pigs is not confined in practice to the dairy-farmer, but is suitable for any one who wishes to engage in pig-raising. The only difference is that while the dairyman uses milk as a supplementary food the other allows the pigs a liberal supply of grain to balance the ration. Most feeders use a ration of 1 lb. to 3 lb. of maize, barley, wheat, or oats for every 100 lb. weight of pigs.

Lucerne ranks first among all forage crops for pigs. It pays to go to some trouble to establish this crop, as there is nothing better than a good lucerne stand if looked after and not grazed too heavily. Lucerne hay has proved a valuable food. It can be fed in open racks, chaffed, or ground, and the pigs accept it readily. Rape ranks next; it is a splendid crop for pigs, and, moreover, can be grown in almost any locality. Two feedings can be got off each sowing, and for pigs it can be sown much earlier than the usual planting for other stock. It should be remembered that pigs must not remain long on the rape crop at the start, as it is very laxative and liable to cause scouring. This means that until the pigs have become accustomed to it they should be allowed on it only a few hours daily. It should not be fed till it is from 12 in. to 14 in. high. Peas are a very valuable crop, and can be fed down either in the green or ripened stages. When green, with the pods just forming, the pigs will clean up every bit. Wheat, barley, maize, oats, rye-corn, and millets are all good when in the green and succulent stage, and are improved when peas or vetches are sown with them. Pumpkins are a good crop for winter use, and do well when sown in conjunction with maize for grain. All the root crops are valuable, but owing to turnips and swedes being often affected with diseases, such as club-root and dry-rot, there is some risk in depending on them for winter use. Other roots, such as carrots, mangolds, and parsnips, entail considerable labour, but are excellent foods, especially mangolds. This latter crop should be stored for at least three months in order to allow the sugars to form, in which stage it gives the highest feeding-value.

Artichokes.—Owing to the amount of labour required in sowing and tending root crops it may not always be within the power of the average dairy-farmer to raise these for pigs. As an alternative, feeders may be advised to plant an area of artichokes. In the writer's opinion artichokes, with their high feed-value, bid fair to become the staple winter food for pigs in the future. One acre of the crop has a carrying-capacity of twenty sows or a large number of big store pigs for four to five months, while in rooting out the tubers the pigs do all the harvesting. It is not advisable, however, to plant artichokes in any ground that will be required for other purposes, for they take charge and are very hard to eradicate. The best plan is to select a piece of land that can be used for artichokes alone. With judicious working it will continue to grow tubers for twenty years from one sowing, provided a liberal amount of manure is supplied and the bare patches which may occur from time to time replanted from the seed already on the ground.

Minimum Prices of Wool.—The fixation of minimum prices for wool, under clause 4 of the Board of Trade Wool Industry Regulations gazetted in June, 1921, has been revoked.

SEASONAL NOTES.

THE FARM.

FIELD-CROPS AND PASTURES: NORTH ISLAND.

LAND that has been prepared early may be sown in September with oats, oats with spring tares, or oats with field-peas. For chaff or hay about 3 bushels of Algerian oats to the acre should be sown with 2 cwt. to 3 cwt. of superphosphate. On well-drained soil clipped seed-oats may be used with advantage, but ordinary seed should be sown if the soil is heavy and wet. If the weather is favourable the crops mentioned should be put in as early in the month as possible. Grey spring tares are to be recommended for sowing with oats. The price of the seed is high, but the sowing can be reduced to 1 bushel of tares with 2 bushels of oats. For dairy cows, calves, pigs, or sheep, green oats and tares provide good supplementary forage.

Land on which it is proposed to sow maize, sorghum, or millet should be under cultivation in September. Early cultivation for these summer crops is to be strongly recommended. Land intended for rape, kale, and roots such as mangolds and soft turnips, should be turned over if this work has not already been done. In selecting a field for turnips or swedes it is wise to see that a suitable run-off paddock is adjacent or handy to the area chosen. In feeding off roots some roughage is desirable and necessary for the well-being of the stock.

Farmers who intend saving grass hay should, if the area is not already top-dressed, put on without delay some quickly available fertilizer. Superphosphate, 2 parts, and ground limestone, 1 part, make a good dressing if applied at the rate of 3 cwt. to 4 cwt. per acre. On soils poor in humus 1 cwt. of blood-and-bone should be added. Powdered rock phosphate or basic slag instead of lime with the super on moist soils good in humus has given satisfactory results on a number of farms.

The feeding-off of early-sown cereal crops should be completed by the end of September, and after the last feeding the crops will be greatly benefited by a stroke or two of the tine harrows, followed in about a week's time with the roller.

Keep the harrows going on pastures to distribute stock-droppings. A stroke or two with the harrows at this time of the year will do nearly as much good as a top-dressing of artificial fertilizer.

Lucerne should be cut or fed off towards the end of September and, if the land is dry, given the necessary cultivation. If it has been properly worked in the autumn and has not been grazed heavily it should require very little work in the spring, one or two strokes of the tine harrows being sufficient in most cases. If, on the other hand, autumn cultivation has been neglected and the area consolidated by heavy grazing, the work will require to be more thorough and the cultivator or disk used. The cultivator is the better implement, and this should be fitted with special lucerne-teeth. Where the disk has to be used care should be taken not to put much cut on, but to run the disks as straight as possible, otherwise a number of plants will be destroyed. The disk should be used to cut the hard surface, and subsequent cultivation done with tine harrows. The cultivator should also be followed by harrows to shake up the grass and weeds, and leave a level surface for the mower. Never cultivate lucerne when the land is wet. Spring cultivation is intended to open up the surface of the land and bring about a rapid vigorous growth of lucerne, so as to smother weeds rather than destroy them by cultivation, therefore it should be delayed until the weather is warm enough to allow the lucerne to grow rapidly. Generally these conditions exist about the end of September. If the land is in good heart and the crop doing well no manure is required, but if the land is poor or the crop hanging fire it will be greatly benefited by a top-dressing. If plenty of lime has been applied there is nothing better than superphosphate, but if the liming has not been heavy, or

heavy growth is not desired until the autumn, better results will be obtained form basic super, basic slag, or similar mixtures. Apply at the rate of from 2 cwt. to 3 cwt. per acre, and harrow in. If any green-crops are being grown in preparation for lucerne, these should be turned under during September.

In North Auckland September is a good month for making spring sowings of paspalum-grass, provided the land is well drained and the seed-bed well prepared. Feeding out paspalum hay along with roots on to pasture on which it is the intention of the grower to get a take of paspalum is done on some farms with good results, the land being thus seeded cheaply. In the Northern Wairoa it is found that a strip of about 18 ft. to 20 ft. sown in cocksfoot around the paspalum will help towards keeping it from spreading to adjoining paddocks on the farm.

SOUTH ISLAND.

The weather conditions prevailing during the month, coupled with the state of the ground, will, to a large extent, be the deciding factors as to what cropping-work may be accomplished, but it is during September that the bulk of the spring-sown cereals are put in. In Otago and Southland, as a rule, sowing is carried into October and November, depending on the severity of the preceding winter, but there should be no reason for such late sowings this season, as the ground has in most places been in fairly good condition for team-work, and cultural operations are well advanced. The end of September is quite early enough for barley in most districts, as early-sown crops do not usually give a good malting sample.

The place of wheat in the arable-farm rotation is after grass, potatoes, clover, peas, or rape, and it does best after the last three named crops. Oats may be sown anywhere in the rotation. The necessity for pickling the seed cannot be over-emphasized, and the formalin treatment is recommended. To do this effectively 1 pint of commercial formalin is mixed with 30 gallons of water. The grain is put in half-sacks, placed in the solution, and moved continuously for ten minutes, the sacks being then placed where they will dry as soon as possible. Cereal crops respond well to the use of fertilizers, and it is recommended to sow with the seed 1 cwt. to 2 cwt. of super or basic super per acre.

Pastures which have been used for carrying the stock over the winter will require renovating in order to stimulate the growth of young grass. Chain-harrowing has to be resorted to in order to spread the dung, and if a top-dressing of some phosphatic fertilizer has not been given, this should be done—especially on pastures devoted to milk-production—by applying either finely ground Nauru phosphate, basic slag, or basic super, at the rate of 1½ cwt. per acre. Grass-seed can now be sown over the young wheat or oats, after harrowing, or over the barley now or at a later date. When a short-rotation pasture is required quick-growing temporary grasses and clovers should be sown. For pastures designed to last for some years a judicious mixture of temporary and permanent grasses and clovers should be employed.

Intending lucerne-growers should have their land in good condition by the end of the month, but except on clean ground in parts of Central Otago they should be in no hurry to sow. The competition of weeds in the early stages of lucerne-establishment is one of the most frequent causes of failure, and wherever weeds are troublesome it is almost in all cases advisable to keep on cultivating the ground right on till Christmas, or even later, before sowing. This is particularly true in the case of ground infested with fat-hen, an only too common feature in all the drier districts of the South Island. On irrigated areas ditches should be cleared of weeds and opened out so as to allow a good flow of water, and everything made ready for the coming irrigation season.

Where early lambing is practised rape should be sown about the end of September. The secret of lamb-fattening is to ensure that the lambs do not receive a check at any stage. Land intended for root crops should be cross-ploughed and well prepared. Land for potatoes should be well cultivated, and a few early varieties for table use may be planted. The main crop, however, should not be put in for some time to come, unless in dry warm situations. All seed for planting should be picked over and any tubers showing signs of deterioration discarded.

—*Agricultural Instruction Service.*

THE ORCHARD.

TRAINING GRADERS AND PACKERS.

As the fruit-export trade increases the lack of skilled graders and packers becomes more evident. In view of the amount of labour available and the congenial nature of the occupation this is somewhat difficult to understand. What is required in this direction is a course of instruction to be given at centres where the material is available for the training of competent graders and packers. The larger centres, such as Auckland, Wellington, Christchurch, and Dunedin, should provide ample labour to undertake this class of work in the fruitgrowing districts during the season, and in order to make sufficient skilled labour available there appears to be no insurmountable reason why classes of instruction should not be established in these and other centres where a sufficient number of pupils could be obtained to warrant setting up classes, in which daily or nightly courses of instruction would be given for fortnightly periods. By taking up this kind of educational work during the winter months I venture to say that sufficient skilled labour would be made available from the cities to meet any immediate shortage during the following season. The congenial nature of the work, together with the opportunity to obtain employment in the country, should be sufficiently attractive to induce city dwellers to take to this class of work just as readily as hop-picking and fruit-picking, once they became proficient enough to warrant employment. This matter might be taken up with advantage by fruitgrowers' associations and provincial councils where such have been formed in the populous centres. The chief requirements are a suitable hall or building, and a supply of fruit, wrapping-paper, and cases, with a competent instructor. At the end of the course qualified pupils should be encouraged to sit for examination for the Agriculture Department certificates of competency in grading and packing, which are issued free of charge to successful candidates. In course of time employment by fruitgrowers and packing associations could be restricted to those holding such certificates, so as to ensure the engagement of employees only who are skilled in their work.

—W. T. Goodwin, Assistant Director of the Horticulture Division.

AUCKLAND.

At this period spraying operations must take precedence. The early applications are most important, and should be regarded as preventive rather than as curative measures. Fruit-trees may be protected from attack by fungus diseases generally by careful and thorough applications at the correct period. Spraying for the month is recommended as follows: Stone-fruits—Bordeaux, 8–6–40, when the buds are showing pink. Apples—Red oil (if not already applied), 1–12 or 1–14, at first bud-movement. Bordeaux, 8–6–40, at first bud-movement, followed by lime-sulphur, 1–30, or bordeaux, 6–4–40, at the cluster-bud stage. This may be followed again by the 3–4–50 bordeaux, or lime-sulphur, 1–90 to 1–100, with the first arsenate spray. Pears—Red oil, 1–10 to 1–12 (if not already applied), at first bud-movement. Bordeaux, 8–6–40, just after first bud-movement is noticed, repeated at 6–4–50 strength at the cluster-bud stage, and, if necessary for black-spot control, again at 3–4–50 with the first arsenate spray.

The best efforts of orchardists will be required during the coming season if red mite is to be kept within reasonable control. Climatic conditions such as those experienced in the northern districts during the spring and summer of last year are most conductive to its spread. Although red-oil applications will delay the hatching of the mite for a short period, the main control should be effected when the first hatch emerges. The following programme of lime-sulphur applications is recommended: Green-tip stage, 1–20 to 1–25; pink, 1–30 to 1–35; petal-fall, 1–50 to 1–55. Subsequent sprayings may be undertaken at 1–100 in conjunction with arsenate-of-lead applications.

Until good heavy growth has started in the spring citrus sprayings with red oil should be delayed, owing to the low condition of these trees brought about this season by the heavy frosts experienced. A strength of 1–40 may then be used.

Fireblight: Growers are referred to my remarks under this heading in last month's notes, and urged to carry out the prescribed work as promptly as possible.

—J. W. Collard, Orchard Instructor, Auckland.

HAWKE'S BAY.

What are probably the most important sprayings of the whole year must be attended to during the coming month. Each variety should be treated as it attains the correct stage; the time of application being equally important to the compound used.

Stone-fruit trees which have not received the spring application of bordeaux, 8–6–40, should be attended to as the most advanced buds show pink. If the trees have become well advanced in colour of bud before this could be done, use 3–4–40 bordeaux. This spraying is used as a precaution against leaf-curl, bladder-plum, shot-hole, and rust. For brown-rot it is advisable to apply lime-sulphur, 1–120, at fruit-set period. Black aphis may be controlled with Black Leaf 40, ½ pint to 50 gallons of water, with 1½ lb. soap as an adhesive.

Though there are certain varieties of apples which russet badly if bordeaux is applied too late, all varieties will benefit by an application if made before pink cluster; in some instances, however, lime-sulphur is preferable owing to the necessity of controlling powdery mildew. For working conveniences apples and pears may be divided into classes and treated as follows: Apples and pears not subject to russet—Early bud-movement to green-tip, oil, 1–17; open cluster, but not showing pink, bordeaux, 6–4–50; petal-fall, bordeaux, 3–4–50. Apples and pears inclined to russet—Early bud-movement to green-tip, oil, 1–17; open cluster, but not showing pink, bordeaux, 6–4–50; petal-fall, lime-sulphur, 1–100. Varieties russeting badly and also subject to powdery mildew—Early bud-movement to green-tip, oil, 1–17; open cluster, but not showing pink, lime-sulphur, 1–25; petal-fall, lime-sulphur, 1–120, plus 3 lb. of atomic sulphur.

It will be noted that with the various apples and pears, regardless of liability to russet, an application of oil is advised at bud-movement and even as late as green-tip. At this period the maximum efficiency of control against the various insect pests is assured, while the general effect on the eggs of red mite is such that the hatching-time is retarded considerably, and the trees are safe-guarded against an early attack of these insects during flowering-period. Successful control depends a good deal on promptly killing the first brood of insects as they emerge from the egg. Hatching varies a good deal with the locality and the season. A close watch should be kept and lime-sulphur applied when mites are first hatching. The strength to use will depend on the state of the trees: open cluster, 1–25; pink cluster, 1–40; petal-fall and later, 1–100.

—*W. H. Rice, Orchard Instructor, Hastings.*

NELSON.

Higher and lower forms of organic life renew their activities in the spring. To protect our fruit-trees from the attention of fungus and insect feeders it is customary to spray them at periods that long experience has shown to be the best. The present time is one of the most important of those periods. A thorough spray campaign now will intercept the attacks of the worst fungus and insect enemies of our orchards.

The stone-fruit trees are the first to break into growth. If the spraying recommended in last month's notes is not completed it should be done without delay. Pear-trees will follow, and should receive similar spray treatment, the oil being applied if pear-mite or scale insects infect the trees. The last trees to start growth are the apples, and before doing so they should be thoroughly sprayed with a fungicide. In sections where black-spot and other fungi have been troublesome bordeaux at winter strength should be applied, and if the trees are affected with scale an application of red oil, 1–12, should follow. Other growers prefer to use lime-sulphur, 1–10, in the place of bordeaux. These applications are usually made early in the month of September. So serious is the danger of infection from such fungi, it is customary to make a further application of a fungicide as the blossom-buds break and show the pink petals; in extreme cases bordeaux is again applied, though at a weaker strength. As an application of bordeaux at this period causes considerable russet on the fruit of most varieties of apples, it is used only in special instances, lime-sulphur being otherwise used at this period, at strength of 1–30 to 1–50. At this application be careful to test the bordeaux for acidity. The dilution of lime-sulphur given is for a concentrate at 33° Beaume; a weaker concentrate should be diluted accordingly. Black scale on lemon-trees can be controlled by a spraying of red oil, 1–40, now.

Orchards in cover-crop should now be ready for ploughing; follow almost immediately with the harrows, doing the work only when the soil is friable. Give a liberal dressing of manure to blocks of trees that have cropped heavily and are requiring it. Tree-planting should be completed without delay. Towards the end of the month the growth in pip-fruit trees will be sufficient to enable grafting to be carried out successfully. Hares do a lot of damage in young orchards at this season of the year; steps should be taken to prevent this.

—W. C. Hyde, Orchard Instructor, Nelson.

CANTERBURY.

Pruning should be completed as soon as possible, and all prunings gathered up and burnt. Scions for reworking trees later on should be selected now and put in a cool place until they are required. It is essential that they be kept from shooting, as the trees will not be ready for grafting until well into September. All trees for reworking should be left unpruned until they are ready to graft. They can then be cut off at the height where it is desired to place the scions. Planting should be completed as soon as possible, if weather conditions are favourable, as advised in last month's notes.

Spraying will be the most important work to be considered from now onward. Each variety should receive attention as it reaches the correct stage. Stone-fruits will be the first that require attention, using 8–6–40 bordeaux as the buds are swelling. This spraying will prevent leaf-curl, shot-hole, bladder-plum, and other fungus diseases. Where brown-rot has been in evidence the previous season the above spraying should be followed with lime-sulphur, 1–120, at petal-fall, and at intervals following as occasion requires.

Pip-fruits should receive an application of red oil, 1–20, at bud-movement, for woolly aphis, red mite, and scale insects. This should be followed with bordeaux when buds show pink, at 6–4–50, at petal-fall, 3–4–50, and, on pears, at intervals throughout the season for control of fungus diseases. As some varieties of apples russet very badly when bordeaux is used I would advise using lime-sulphur, after the first application of bordeaux, at a strength of 1 gallon lime-sulphur to 120 gallons water. This should be continued throughout the season, combining with arsenate-of-lead applications when spraying for codlin-moth. Care should be taken to add about 3 lb. of fresh-burnt lime, reduced to milk-of-lime, to the mixture, so as to prevent scorching.

Cover-crops should be turned under as soon as conditions are favourable. Other cultivation should follow later, when the land is in a suitable condition.

—L. Paynter, Orchard Instructor, Christchurch.

OTAGO.

Planting operations should be well in hand. Carefully select the best stock available in the shape of strong well-grown trees, yearling rods for preference. The roots should be trimmed well back before planting, and all broken or bruised portions removed. When planting, tread the soil firmly around the roots. This makes the tree more firm in the ground and renders it less liable to move about when the wind blows. It also prevents the air from drying the soil around the roots, thus conserving the moisture. Rods should be headed back to about 15 in. high when planted. Two-year-old trees should be pruned hard back to about 3 in. or 4 in. on three well-selected, evenly-spaced branches, all other growths being removed.

Growers contemplating grafting over with other varieties should select the scions in readiness. A good way for keeping these fresh is to lay them in long grass.

As spring approaches and the buds commence to move, so also do the fungus spores become active. This is particularly the case with powdery mildew. The remedy that has given the best results for controlling this disease is lime-sulphur, applied at the green-tip stage at a strength of 1–10, followed in the pink stage at 1–30. Where black-spot was prevalent last season growers are recommended to spray with bordeaux, applied at the following strengths: Green-tip, 5–4–50; between open cluster and pink stage, 3–4–50.

—B. G. Goodwin, Orchard Instructor, Dunedin.

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

WHERE winter eggs are the objective, September will prove the best month for hatching out the popular egg-producing White Leghorn. Obviously, during this period the great bulk of incubating and brooding work must be carried out. Providing the stock are to be reared under ideal conditions there is no objection to hatching White Leghorns early in October, but the end of September is certainly the better time. On no account should hatching operations be extended beyond the end of October. Stock brought out later than this not only prove difficult to rear, but, even if they are reared, they seldom or never prove really profitable. Another drawback to late-hatched birds is that they are always more susceptible to passing ailments than are the chickens brought out earlier in the season. In short, it will generally be found that the breeder is better without such stock.

POINTS IN BROODING.

Losses in the brooder stage are inevitable, but the greatest loss usually takes place towards the end of the hatching season and with the approach of hot summer weather. Much of the mortality could be easily avoided by studying the best methods of applying heat and ventilation in the brooder. In this connection the system of management must be amended to suit the prevailing weather conditions. It is common for poultry-keepers to work their brooder in exactly the same manner in October and November as during, say, July and August, when heavy frosts are experienced. By this it is not implied that the late spring and summer weather is necessarily more favourable for chicken-rearing than are the earlier months—far from it. Personally, I prefer the latter, chiefly for the reason that at this period of the year the weather conditions are more uniform than is the case later in the season. It is the sudden extreme variations of climatic conditions experienced with the approach of summer which have to be guarded against and which cause great mortality during the brooder stage. It is common at this season for a hot night to follow a cold day, and this is where the chief danger lies, chiefly for the reason that the chickens become overheated at night, and on leaving the brooder next morning the extreme change proves too much for them, so that they succumb to chill and its attendant troubles—white diarrhœa, &c.

It is well known that during hot weather chickens will, even when at a comparatively young age, invariably thrive better if removed from the brooder to a colony-house. Undoubtedly this is chiefly due to the increased amount of fresh air which is made available to them. Of course, it is not suggested that the chickens should be hardened off at a very early age, as this often means a serious check in development. They should be well brooded, but care should be taken to provide the desired warmth and fresh air at all times. No brooder is complete unless some provision is made for allowing the chicks to move away from the heat when this is excessive, and at the same time to secure the necessary fresh air which instinct demands. A plentiful supply of fresh air in the brooder-box is one of the chief secrets for the successful rearing of chicks, especially when warm-weather conditions prevail.

Towards the end of the last hatching season many complaints of very heavy mortality reached me from plants where colony coke-burning brooder-stoves were being used. In the majority of cases it was pointed out that good results had been obtained earlier in the season. I attributed this largely to the lack of moisture in the brooder-chamber, and to some form of gas created when the warm weather set in. As a preventive I advised using for bedding fine earth frequently moistened with a fine spray of water, instead of the chaff mostly used for this purpose. This, generally speaking, had a desirable effect. On one plant, in addition to keeping the soil under the chickens moist, the owner hung wet sacks around the walls of the heated room. He later reported that his chickens did better under these conditions than ever before. It would therefore appear that by using such means the chickens are not only provided with the necessary moisture demanded for their welfare, but, in addition, it is very probable that the added moisture put into the room has the effect of breaking up any injurious gases that may be present. Of course, where colony brooders are being used, in view of the large number of chickens being reared in the one small room, it is imperative that ample ventilation-space be provided.

THE PELVIC BONES AND EGG-LAYING CAPACITY.

A correspondent asks if the width of the pelvic bones is an infallible guide to the egg-laying power of a bird. I can only reply that so far as my experience guides me the width of these bones gives little or no indication of laying-capacity, and, as a matter of fact, merely indicates whether a bird is laying or not. The best layer in the flock may be examined just as she has commenced a moulting or broody period, when the distance between the bones will within a few days have contracted to the non-laying width. Birds have come under my notice that did not lay enough eggs to pay for the cost of their feed, but with a width which would easily take four fingers, so that they would be declared champion layers on the pelvic-bone test. On the other hand, I have known other birds of the same breed and in the same flock which would not admit more than three fingers at the most, and yet trap-nesting proved that they laid well over two hundred eggs in the year.

As a guide to the annual laying-capacity of a bird the width of the pelvic bones corresponds with the condition of the comb. Just as the latter reddens the former widens, indicating that the bird is laying or coming on to lay. The worst layer in the flock will at certain periods have a bright-red comb, indicative of laying-condition. Thus to apply the pelvic-bone test to, say, a medium layer when she was laying would credit her with a power she did not possess. On the other hand, to apply it to a good layer when she was not laying would discredit a power she did possess. Of course, there is less variation with the male, and what variation does take place is influenced by the condition of the bird. It is to be regretted that many a good strain, both from a breed and egg-laying viewpoint, has been destroyed simply by reason of the sire's quality being determined according to the pelvic-bone myth. After all, the chief guide to selecting birds to produce heavy layers is to first know the pedigree of performance behind them, and this should be combined with both breed and laying-type, together with the possession of maximum points indicating constitutional vigour. To breed from stock merely because they happen to be wide between the pelvic bones obviously means the production of progeny of all shapes and sizes, and this, as is well known to all practical poultrymen, does not tend towards the maintenance of a heavy-producing flock.

The only way to build up or to maintain productive capacity is to breed from fixed types of purebred strains, care being taken that they conform to standard weight requirements. Small weak types of a breed, even with a high egg-record behind them, will never have the effect of maintaining the desired characters and productive capacity looked for in an ideal breeding specimen. It must be admitted that the medium-sized bird of its breed is usually the best layer, and therefore carries away the chief honours in the egg-laying tests, but we have ample evidence that the progeny often proves a woeful disappointment. In the breeding of any class of live-stock it is well known that any one character can be improved to any notable extent only at the expense of another, so that if everything is sacrificed for egg-yield other essentials for the maintenance of a strain must necessarily suffer as a consequence.

THE APIARY.

H. W. GILLING, Apiary Instructor.

THE SPRING OVERHAUL.

It will be advisable to examine the bees on the first suitable day in September, and note their conditions. Any colonies that show signs of foul-brood should have the hive-entrances reduced, if that has not already been done, and be marked for treatment later or removed to a hospital yard. If, however, the diseased colonies are weak, with the disease in an advanced stage, destroy them—it is not worth while to risk the spread of the disease to other colonies by robbing. The honey in a diseased colony is infected, so it will be obvious that if robbing sets in one diseased colony may infect the whole of a large apiary.

Note, too, if the colonies are queen-right. In a well-ordered apiary the apiarist knows the age of every queen, and sees that none of his queens are so old as to be apt to die of old age during the winter months. Every colony should be requeened at least every two years. Keep a record of the age of each queen—do not trust to memory. If any queenless colonies are found in the

spring overhaul it is not advisable to try to requeen them. Quite apart from the difficulty of obtaining a queen at this time of the year, the bees now in the hive are mostly old ones carried over from last season, and it is difficult to get such bees to accept a queen. Later in the season such a colony could be requeened by giving the bees a frame of open brood and allowing them to raise a queen of their own, but this is out of the question at present, as there are no drones flying. It should therefore be united with a strong, queen-right colony. To do this place a sheet of newspaper immediately over the brood-chamber of the strong colony and put the queenless colony on the paper. The two colonies of bees will tear away the paper in due course and settle down to live together.

We cannot always account for a colony proving queenless. In the apiary of a careless beekeeper who does not requeen his apiary it is no doubt due in the majority of cases to the queen dying of old age. Queenless colonies are, however, found at the spring overhaul in the apiaries of the most careful beekeepers. It may be due to the queen being accidently crushed in the handling of the frames, or possibly the bees have balled their queen. Dr. Rennie states that "loss of the queen is one of the possible features of *Nosema apis*."

FOOD-SUPPLIES.

Note carefully what stores each colony possesses. If any are short of stores, sealed combs of honey from other colonies should be given them if the apiary is from foul-brood. Do not transfer either honey or brood from one colony to another unless it is known that the source from which these are drawn is free from disease. If sealed stores are not available give the bees a slab of candy. To make candy place 5 pints of water in a preserving-pan and bring it to boiling-point; then add 12 lb. No. 1A white sugar and $\frac{1}{8}$ oz. cream of tartar. Stir until every particle of sugar has been dissolved, and then boil until the syrup reaches a temperature of 240° F., when it may be removed from the source of heat and allowed to cool to about 150°. Then stir it vigorously, and the liquid mass will soon resolve itself into a fine white candy, which should be run into moulds before it sets. In feeding the candy to the bees place it immediately over the cluster under the mat. It is still rather early to feed syrup, as the bees are loth to leave the cluster to take it from the feeders. If syrup-feeding is resorted to it is preferable to feed in the combs. The syrup should not be thinner than one part of sugar to two parts of water.

VITICULTURE.

J. C. WOODFIN, Vine and Wine Instructor.

THE VINEHOUSE.

THE young shoots on the vines can be thinned down to the two strongest on each spur. These can be retained until a decision can be made as to which will carry the finest bunch. It is not necessary to wait for the grapes to set, as a good idea can be obtained from the size and shape of the budding flower-clusters, combined with the suitability of the lateral to form a strong well-placed spur for the following season.

As a rule only one bunch should be left on each lateral and one lateral on each spur. Like many rules, this has its exceptions, and the number of bunches retained can be less in the case of a young or weak vine, and more in the case of a strong well-fed vine, also when the number of bunches is of more importance than their size. Some growers leave two bunches on each lateral, and some two laterals on each spur. The danger of this practice lies in overcropping, which means a failure in the following season, and sometimes the effect is observable for several seasons. Overcropping may also result in want of colour, and this is frequently the case with regard to the Gros Colman grape.

As the laterals are very fragile at this period great care should be taken when tying them down to the wires. A lateral that does not come into position easily can be given a gentle twist: this will permit of it being brought more easily into place, and the lateral will not be so liable to snap after being tied, as sometimes occurs.

Bottom ventilators should be kept closed from now onward, or mildew will probably appear on the vines, necessitating the application of sulphur.

THE VINEYARD: BENCH GRAFTING.

Bench grafting can now be proceeded with and the grafts placed in the callusing-bed. In principle, grafts once made should form a union as soon as possible, and to obtain this the grafting should be done when vegetation is starting. There are many systems of grafting, but two only will be dealt with at present—the whip-tongue graft and the wire graft, both of which give perfect unions. The components of the graft—the stock and the scion—are brought together so that the soft cellular tissue between the wood and the bark, known as the cambium layers, will unite when placed under favourable conditions of heat and humidity. The union is brought about by the formation of a callus or cicatrizing-tissue between the stock and scion. This callus originates principally from the cambium layers, and when the conditions are favourable it completely covers the parts brought into contact, which then function like other parts of the vine. To obtain a perfect union it is necessary to bring the cambium layers of the stock and the scion together. When the two parts are of the same size this is a simple matter, but when the stock is thicker than the scion this latter is placed on one side of the stock so that the cambium layer of one side of the scion corresponds exactly with that on the side of the stock.

The stock cuttings, which have been stored in dry sand in a suitable cool place to keep them in a dormant condition, should be taken out and cut into lengths of about 10 in. The bottom bud should be cut through so as to leave the woody partition between the piths of the internodes intact, and 1½ in. to 2 in. of internode left above the top bud, keeping the stock cuttings as regular in length as possible. Should the buds on the stocks have begun to swell a little they can still be employed, but it is essential that the scion wood should be in a dormant condition when used, and all further operations should be conducted with a view to keeping the vegetative powers and rooting of the stock in advance of the growth of the scion. All the buds on the stocks, including the dormant buds at the sides of the principal buds, should be cut out, or they will probably form suckers in the nursery and be the cause of considerable trouble. The stocks can now be placed upright in water until the water rises through the wood and forms beads on the newly cut surface of the upper extremities, when they can be graded and placed in separate heaps or divisions, or convenient boxes, under pieces of damp sacking to keep them moist. They can be sorted into five or six sizes with the aid of a wooden or metal grader, which can be cut out of a piece of wood or metal measuring 12 in. by 2 in. Cut a tapering slot from one end, starting with an opening of ½ in. and tapering to a point near the other end. Then measure the distance from the opening to a point where the taper has contracted to ¼ in. Divide this distance into eight spaces and number them on the grader. In grading the stocks it will be noticed that the cuttings are not round but slightly flattened, so care should be taken to present them all in the same position in the grader. The scions should be cut with 2½ in. of internode below the bud and about ⅜ in. above it, and treated like the stocks.

To make the whip graft the stocks and scions are both cut with a sharp knife to an angle, the face of which should be equal in length to about three times the diameter of the wood. The cuts should be made with a drawing motion and in one cut, so as to obtain a complete contact of the surfaces. The tongue is then prepared by inserting the blade of the knife above the pith, and drawing it in the direction of the grain a little more than half-way down the cut. When extracting the knife the edge of the tongue should be pressed slightly outwards to facilitate the bringing-together of the scion and stock, which, when pressed into position, should form a perfect union in all parts and be fairly firm. To avoid accident in handling it is preferable to bind the union with a little rafia, making a couple of close turns below the joint, a few turns in an open spiral over the joint, and finishing above it with another couple of turns, the end drawn tight under the last one. No wax or similar material should be used, as air is essential for the formation of the callusing-tissue.

The wire graft is made in the same way, excepting that instead of a tongue being cut a piece of No. 17 galvanized-iron wire about 2 in. long is pushed into the pith of the stock and the scion pressed on to it. Where the pith is large two pieces can be used. This makes a very exact and firm union, rendering tying unnecessary in the majority of cases. It is a graft that is very easily made, and produces a perfect union, and the iron does not seem to affect the vines in after-life.

The grafts now being ready, they can be stratified in sand containing a little more moisture than that in which they were kept during the winter, but dry

enough to run into the bundles. Any wooden case will serve the purpose if it is large enough and about 20 in. deep. One side should be arranged so that it can be easily taken off, to facilitate taking out the callused grafts. To render easy the packing the case should be inclined and a layer of 4 in. of sand placed on the bottom and at the end of the box. The grafts are then placed perpendicularly in packets of ten (tied with a little rafia) in rows, separating them all round from the case with about 4 in. of sand, and filling in with sand as the packing progresses. When the packing is completed 6 in. of sand is placed over the top of the grafts and covered with a sack or two. The case is now ready to be placed in a locality where a temperature of from 60° to 65° F. can be maintained with either artificial heat or by placing the case in a bed of stable manure. At the end of a month the callus should have formed, the roots have started to grow, and the buds to swell. The grafts are then ready to transfer to the nursery.

The grafting of rooted stock should be deferred till the sap begins to rise.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

Winter Rhubarb.—This type of rhubarb is evergreen—it never dies down—and is termed winter rhubarb because it is available for use during that season. The number of inquiries received about it show that interest in it is increasing. There can be no doubt that with proper management this rhubarb can be made a valuable crop in districts not subject to continued hard frosts. One of the reasons for the poor results usually obtained is that growers will persist in using it throughout the summer months. When this is done the plants become weakened, produce but little during winter, and do not strengthen up again till spring, when the same course is in all probability again pursued. If a supply is required in summer as well as in winter, there should be two beds, one being of the summer variety. Of course, an all-the-year-round supply can be got by growing only the evergreen variety, leaving sufficient plants untouched in summer to supply the winter crop. The disadvantage of this course is that the stalks of the summer varieties are so greatly superior in size as to render them of far greater value for home use, and the evergreen varieties have no market value in summer.

Beds can be established by dividing the clumps, one or more crowns being taken. This can be done at any time except the midsummer months. My own experience is that seedlings are best, as they make stronger growth, but division of clumps is useful for keeping and increasing specimens of extra good type, these to be used for the production of seed. The following plan I can recommend from actual experience for securing a quick supply and securing a bed of good-type plants. It may be first premised that seedlings are likely to vary greatly in type, some giving poor stalks, others good stalks few in number, and others, again, giving good stalks and plenty of them. This latter type is the one wanted. Sow in October in rows 12 in. or 15 in. apart, dropping two or three seeds in clumps 12 in. apart in the rows. When the seedlings are up thin to one in each place. Keep the soil clean and open by frequent hoeing. By the middle of February there should be plenty of stalks about a foot long, and pulling can begin. Later on every alternate row will be removed, leaving the rows 24 in. or 30 in. apart. Similarly, every other plant in the remaining rows will come out, leaving the plants 2 ft. apart in the rows. It will thus be seen that only half of the plants in alternate rows will finally remain to constitute the permanent bed, and from these plants no stalks should at first be pulled. All the other plants may be robbed of stalks as fast as these are made, but any that show special merit should be marked by a label so that they may later on be transplanted.

When the permanent plants demand more space the alternate plants in each row should be chopped out, and later on, towards the end of winter, the alternate rows must be removed. Dig out those required for transplanting; the others can be chopped out with a spade. By the time this stage is reached the temporary plants will have provided a good bulk of stalks, and the permanent plants will be ready for pulling from. It is the habit of this type to throw seed-heads very freely. Seeds should be saved from the best types for enlarging the plantation, the heads not wanted for seed being broken off as soon as they are seen. The

plants should not be pulled from during the summer months, or only to a very limited extent, the stalks being left to die down on the plants. The effect of this will be strong crowns that will produce stalks in winter. The method described is a cheap way of getting a supply quickly from an initial start. First-class soil well manured is necessary for rhubarb. It is little use attempting to grow it on poor or dry soil.

Celery.—Celery requires rich soil and a liberal supply of moisture. Stable manure gives best results, partly because the humus holds moisture. There are two types—one with white stems, termed self-blanching, which can be used without being moulded up for blanching, and the green-stemmed type, which must be moulded up. The former is a delicate plant and fit for growing only in summer except in the warmest districts, where it can be grown in winter also.

White Plume self-blanching is the variety commonly grown for summer and autumn use. In market gardens this variety is usually grown on beds 5 ft. to 6 ft. wide, the plants being set 8 in. or 9 in. apart. Rich soil and frequent watering result in heads which, though small, find a ready market. The amount of labour involved in their production is not great, no moulding up being done. Close planting and quick growth preserve the natural whiteness of the stems. The result is a comparatively poor product, but useful, and it pays. The same variety can be grown to larger size by trench culture, and moulding up greatly improves the texture of the stems, imparting the crispness so necessary to good celery when used as a salad.

The varieties that are not self-blanching possess the best quality, and are capable of making the largest heads. There are a number of varieties, some with a shade of red in the stems; these latter are the best-flavoured. They are not much grown in this country, there being an impression that they remain red after being moulded up, which is not the case. These varieties must be grown in trenches. Any number of rows may be grown in a trench, the trench being of a width necessary to accommodate the number decided on. In this country two rows is usual. A trench is taken out a good spit deep, and some half-decayed manure is placed in the bottom and deeply dug in. Seed is sown in boxes under glass in July for early crops and at intervals till October. In places not too hot seed for the later crops may be sown in the open ground. Pricking-off is necessary as soon as the seedlings can be handled. This may be done in boxes, or in 3 in. or 4 in. of a suitable compost spread on a hard surface in the open, in which case shading with scrim is necessary till the plants get a good hold, and thorough watering is required in the evenings of fine days.

In regard to celery-diseases, rust can be identified by a rust-coloured powder discharged from pustules on the leaves. The disease can be carried on the seeds, in which case the young plants become infected. Wash seeds through a solution of 2 oz. of bluestone in half a gallon of water, and dry before sowing. Spray plants with bordeaux at 4–5–40, or at summer strength of a ready-made mixture. Spraying must be frequent so as to cover new foliage. A weaker solution may be used if the disease is not in a virulent form. Leaf-spot: Little spots scattered over the surface of the leaf, at first sickly green, but changing through brown to almost white, are signs of this disease. The remedy consists in spraying as for rust. Occasionally celery is attacked by small lice, which, if not checked, can speedily make an end of the plants. Spray with Katakilla, XL-All fluid, or Vistolene.

Current Work.—Sow onions as soon as possible. Sow turnips, carrots, turnip-rooted red beet, parsnips (if required early), lettuce, and peas at fortnightly intervals. Celeriac, a very useful and palatable root vegetable, may also be sown, the plants being raised in the same way as celery; plant on the flat, as trenches are not required. Sow radishes and plant lettuces. Early cabbages and cauliflowers should be in good growth. A dressing of nitrate of soda, at a maximum of 1 oz. to the square yard, will push them on. Leeks should be sown by the middle of September. Main-crop potatoes should in the North Island be planted about the middle of September.

Live-stock Statistics.—Preliminary statistics issued by the Government Statistician show approximate increases, as at 31st January last, of 124,313 dairy cows and 30,134 pigs compared with the previous year. Horses show a decrease of 5,404.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

CLEANSING-DRENCH FOR COWS.

"SUBSCRIBER," Hukanui :—

I shall be obliged if you can give me a recipe for a cleansing-drench for cows after calving.

The Live-stock Division :—

A good cleansing-drench for cows which have retained the afterbirth is as follows : Liquid extract of ergot, ½ oz. ; spirits of nitrous ether, 2 drams ; water to 6 oz. In half an hour after administration of this drench an attempt should be made to remove the membranes by first injecting a mild solution of disinfectant and then applying gentle traction.

FARM-KILLED MUTTON.

E. B. L., Bainham :—

Will you kindly give me information as to how farmers who kill their own mutton can tell when a carcase is unfit for consumption. Does the presence of watery bladders on the caul-fat of sheep indicate a diseased condition ?

The Live-stock Division :—

Tuberculosis is practically unknown among sheep. The "watery bladders" mentioned are the cystic stage of development of a tapeworm of the dog. These bladders, if taken into the stomach of the dog, develop into the adult tapeworm in the intestines. When they mature their eggs are voided with the fæces on the grass, to which they adhere, and so gain access to the stomach of the sheep, where they develop into the cysts. The adult worm is the *Taenia marginata*. When these cysts are numerous and the flesh flabby the carcase should not be used for food, and should be buried too deeply for dogs to get at, or, better, burned. With regard to other diseases, any condition which shows the presence of pus (matter), such as septic pneumonia or septic pleurisy, should lead to the rejection of the carcase for food.

TREATMENT FOR TOMATO-PLANTS.

H. F., Canvastown :—

I should like to know if wood-ashes (kept dry) from stove and open fires would furnish tomato-plants with the necessary potash. Would you advise the using of superphosphate in conjunction with the wood-ashes ? Would it be advisable, upon receiving the tomato-plants from a nursery, to immerse them in bordeaux before planting ? If so, what strength of mixture should be used ?

The Horticulture Division :—

Wood-ashes that have been kept dry contain a varying amount of potash. Young growths, such as hedge-clippings, &c., contain more potash than matured timber, and the amount varies in different woods. When using about 7 lb. of ashes per square rod other forms of potash may be left out. By all means supplement with superphosphate. It is advisable to immerse young plants in bordeaux ; the 4–4–40 formula, or summer strength of a prepared bordeaux mixture, should be used.

IVY AND LIVE-STOCK.

W. GOODWIN, Tirau :—

Please let me know if ivy is poisonous, and if a horse eating this plant would be likely to get enteritis from doing so.

The Live-stock Division :—

Ivy is said to be poisonous, but no definite case of poisoning has been recorded among live-stock. In all probability farm stock would need to eat a considerable quantity for serious effects to be induced. In a case which came under our notice a few months ago where a cow had eaten daily for several days a quantity of ground ivy, the animal became decidedly ill. She went off her food, and looked dull and sleepy about the eyes, with constipation. This was followed by violent diarrhœa. The diarrhœa was checked by giving sloppy food, and ½ oz. doses of chlorodyne and bicarbonate of soda were given in a pint of water three times a day. Under this treatment the animal recovered in four or five days. Judging from the symptoms in this case, it would appear that ground ivy is more or less irritant.

EFFECTS OF SUPERPHOSPHATE.

J. J., Manurewa, Auckland :—

I should be obliged for answers to the following questions : (1.) Does superphosphate, as usually sold, contain either sulphur or sulphuric acid ? (2.) If superphosphate contains sulphuric acid, would it be dangerous to stock placed on grass top-dressed with this manure before this has been completely washed in by rains ? (3.) Is a super of higher grade than 42–44 per cent. likely to injure the tender roots of grasses and other plants ?

The Agricultural Instruction Branch :—

(1.) Superphosphate, as usually sold in New Zealand, does not contain free sulphuric acid or free sulphur. It does contain both in a combined form as sulphate of lime. If superphosphate is not well manufactured it may contain a percentage of free acid, but the superphosphates on the market at present are practically without free sulphuric acid. (2.) We have never heard of a case of stock being injured by being placed on grass pasture top-dressed with superphosphate. It would be advisable, however, to allow the fertilizer to be washed into the soil by rain before putting stock on. (3.) Superphosphate made in Auckland at the present time, and which just after manufacture is graded as 42–44 per cent. P_2O_5' loses moisture when allowed to mature and becomes more concentrated, with naturally a higher content of P_2O_5. It is put on the market as 44–46 per cent. super ; and, while this Branch has very little field evidence to show whether it has any burning effect on the roots of grasses and other plants, we do not think that you need have any fear of using it. Some farmers have reported that grasses burned yellow in colour after using this grade of phosphate, but after a good soaking of rain the grass recovered and grew well. If this has been your experience we would advise you to mix the super with lime, in which case you should have no trouble.

HORSE INFESTED WITH LICE.

A. J. W., Martinborough :—

I have a horse infested with lice, and have failed to cure him with various preparations. Will you kindly advise a remedy ?

The Live-stock Division :—

The following treatment has been found very useful for this complaint : Take 1 lb. yellow soap, ½ pint kerosene, and 1 gallon water. Cut up the soap into small pieces and boil until dissolved in the water. When cool enough for application to the horse, add the kerosene, and keep the mixture well stirred during application. This should be well scrubbed into the horse, and the procedure repeated in four or five days. The animal should be clipped all over and then singed before the treatment is carried out.

REVIEW.

"THE VEGETATION OF NEW ZEALAND."

A STUDY of the botanical literature of New Zealand affords convincing proof that the science, in the course of its development in this country, has been singularly fortunate in its exponents. Such men as Banks and Solander and Hooker—to mention but three whose names dominate the earlier period—and the vigorous school of local botanists who followed and were inspired by them, have built a splendid monument in systematic botany, while in none of the younger countries was there a quicker recognition of the profound changes which began to take place in botanical thought in Europe towards the end of last century. The new branch of the science which then arose, to which the name "plant ecology" has been given, and which concerns itself with the living plant in its relation to its surroundings, made such rapid strides in this country that when in 1904 the editors of the great German publication "Die Vegetation der Erde"* sought in New Zealand a contributor to the series, they did not look in vain. In "The Vegetation of New Zealand" ("Die Vegetation der Erde," Vol. xiv, Engelmann, Leipzig), by L. Cockayne, Ph.D., F.R.S., F.N.Z.Inst., the long-recognized leader of New Zealand ecologists has concentrated the results of a quarter of a century's study of the country's vegetation.

As no book in the history of botany in this country in any way closely resembles the present one—the same author's "New Zealand Plants and their Story" being the only work at all comparable to it—it will not be out of place to give a very brief outline of its arrangement. The book is divided into four main sections, the first containing a sketch of the physical geography and climate, the third and fourth dealing respectively with the distribution and history of the flora, while the second, which makes up the bulk of the book, is devoted to a description of the plant-covering of the New Zealand area from the Kermadecs to the subantarctic islands. The reader who turns over the pages for the first time cannot but wonder at the wealth of biological detail with which nearly every one is filled, nor will his wonder be lessened when it becomes plain to him how much of it is the work of one man. To say this is in no way to depreciate the help given by any of those whose assistance is in all cases generously acknowledged, but a glance at the illustrations, which cover an extremely wide range of types of vegetation, and which are nearly all by the author himself, is evidence enough that the important plant-associations which he has not seen with his own eyes must be few indeed.

It is perhaps not generally recognized how considerable a part the personal element plays in a matter apparently so little involving the emotions as the observing and recording of physical facts. No two of a hundred observers would, for instance, describe the growth-form of a plant in quite the same way, and no skill in compilation can reduce to the same value data collected from many various workers. The advantage of having before him a series of pictures of the different types of vegetation all illuminated from the same angle is one which every botanist who studies the book critically will appreciate. If "The Vegetation of New Zealand" possesses this advantage to a striking degree it is due less to the comparatively small area with which it deals than to the untiring energy of its author.

The majority of readers of the *Journal* will no doubt be interested in the book chiefly from the point of view of its relation to agricultural development in New Zealand. In the chapters dealing with the effect of settlement on the plant-covering a vivid picture is given of the changes which man, intentionally or unintentionally, has brought about since his advent, but the real contribution which the work makes to agricultural science is of far profounder significance than any presentation of facts could be. It has only recently begun to be realized how largely the methods employed in this country in the utilization of its natural resources have been those of chance. Surely such a question, for example, as to whether this or that great forest area is to be kept intact for water-conservation,

* The Vegetation of the World.

used as a source of timber-supply, or opened for settlement is one upon which the voice of science, which utters facts rather than mere opinions, should be heard. The plant ecologist, who is guided not only by the teachings of botany, but can correlate them with those of such sciences as geology, meteorology, and chemistry, must be the man qualified above all others to deal with problems which are of nothing less than national importance. Nor does his usefulness end there: wherever the process of replacing one type of vegetation with another is employed in agricultural development—the conversion of forest into pasture is the instance most familiar to New-Zealanders—the application of the principles of his science must have far-reaching effects. Chemistry by itself has failed to show all that it seemed at one time to promise of the relation of a plant to the soil in which it is growing. It is possible to know accurately all the constituents of a soil and still to be ignorant as to what will flourish there and what will not; but the living plant is an indicator infinitely more sensitive than anything devised by man, and already the ecologist, from a knowledge of the present plant-covering of a soil, is able to foretell, with an accuracy hitherto unprecedented, what its capabilities will be. Dr. Cockayne is not primarily concerned in his book with the economic aspects of plant ecology, but no serious student of any of the branches of agricultural science can read the work without feeling that a new power of vision has been acquired by him—that the different plant communities with which he has to deal—pasture, field-crop, or forest—are subject to laws of infinite variety and subtlety, and that even the partial elucidation of some of these laws will confer on agriculture gifts as yet undreamed-of. The flood of scientific literature that has been poured upon the world of late years makes it plain enough that the power to observe and record facts accurately is a far from uncommon one, and that it is one which to a large extent can be transmitted from pupil to teacher, its great development at the present day being doubtless due to the spread of university education and the endowment of research. What cannot be transmitted, and what the book under review shows its author beyond question to possess, is that intuition which sees the essential unity that binds together all facts, however apparently isolated, and can catch a glimpse of the laws which they illustrate. It is the possession of this true philosophic spirit which at once lifts the work far above the level of those that are merely descriptive, and which will, we venture to think, in years to come give it the name of a classic. The style, almost without exception, is simple and lucid, while there are not infrequently hints of a rarer quality: scattered throughout the book are passages, often only a line or so in length, where, in response to the beauty to which he is obviously so sensitive, the man of science forgets himself and something of the poet stands revealed

It is impossible, in conclusion, to refrain from quoting the stirring words with which the book ends:—

"... Finally came man: first the Maori, or it may be his predecessor; but their influence on the vegetation was but slight. Then arrived the European. It is rather more than a hundred since he began to occupy the land, but how great the change his operations have wrought has already been told. We who now live in this wonderful country, and love its marvellous vegetation, have set aside sanctuary after sanctuary where the palæotropic, subantarctic, Australian, and palæozelandic plants, the survivors of that bitter strife with nature that commenced millions of years ago, can still pursue their destinies unmolested by their human enemies and the horde of foreign plants and animals he has let loose. Will our descendants prize this unique heritage from the dim past and preserve these sanctuaries intact?"

E. H. A.

Noxious Weeds.—The Masterton Borough Council has declared gorse and broom to be noxious weeds in the district under its jurisdiction.

Area of Commercial Orchards.—The following are the areas (in acres) of registered commercial orchards in the respective districts of the Department's Orchard Instructors:—Whangarei, 813; Auckland, 5,061; South Auckland, 775; Poverty Bay, 374; Waikato, 794; Wanganui, 358; Hawke's Bay, 2,316; Manawatu and Wairarapa, 815; Wellington, 111; Nelson, 2,756; Nelson Central, 4,539; Motueka, 3,222; Marlborough, 852; North Canterbury, 2,027; South Canterbury, 985; Otago and Southland, 4,166: total, 29,964 acres.

INTRODUCTION OF FRUIT AND PLANTS INTO URUGUAY.

SOME time ago information reached the New Zealand Government from Monte Video to the effect that the importation into Uruguay of fruit and plants from any country where *Aspidiotus perniciosus* (San José scale) was known to exist was entirely prohibited. This Proclamation was, however, subsequently amended, importations being allowed under certain definitely prescribed conditions, the context of which is appended.

Although the Uruguayan authorities require all plants and portions of plants, including fruit, about to be imported into that country to be covered by a certificate issued by the proper authorities of the country of origin declaring such plants or fruit to be free of all diseases harmful to vegetables, San José scale appears to be the disease which is causing the authorities of that country most concern. This is not altogether to be wondered at, as it would be difficult to imagine a pest more strongly condemned as dangerous and destructive than was this scale for many years throughout the United States of America. For a short time after it made its appearance in New Zealand a similar panic appeared imminent. The complete destruction of all affected trees with the view to stamping out the disease was not only strongly advocated, but was in more than one instance actually put into practice. Subsequent experience with San José scale, however, has gone to show that it is much less troublesome than many other orchard pests. In cases of neglect where the scale is left unchecked considerable damage is likely to result, but under ordinary orchard practice, which includes a dormant season dressing with either oil or lime-sulphur, there is not a great deal to be feared from the scale.

The following is a translation of the conditions referred to :—

"*Article* .—The importation, through the Port of Monte Video, of plants, their parts, and fresh fruit proceeding from countries not free of *Aspidiotus perniciosus* is hereby authorized under the following conditions: (*a.*) Every consignment of plants, their parts, and fresh fruit must be accompanied by two certificates: a sanitary certificate of origin issued by the authorities in charge of the vegetable health of the exporting country, in which a declaration shall be made that the consignment is free of diseases harmful to plants; and a similar certificate stating that the products which it is desired to export come from a part of the country of origin that is free of such diseases. (*b.*) The interested parties shall present this, the first certificate, together with a petition for permission to import, to the Board of Agriculture, stating the Christian name and surname and domicile of the importer, the species of the plants and their parts and the fresh fruit which they propose to import, specifying the quantities of each, the destination to which they propose to send the products, the locality where they propose to plant them should the products be destined for cultivation, and name of the steamer. (*c.*) The Board of Agriculture shall proceed to inspect the products to be imported at the Port of Monte Video, and if on examination they are found to be diseased or suspect of being diseased, the Board shall order them to be disinfected, the disinfection being carried out in the manner indicated by the Board, and all expenses in this connection being paid by the importers of the products in question."

IMPORTATION OF FERTILIZERS: JUNE QUARTER.

FOLLOWING are the importations of fertilizers into New Zealand for the quarter ended 30th June, 1922: *Gypsum:* From Australia, 610 tons. *Nitrate of Soda:* Australia, 10 tons; Chile, 75 tons: total, 85 tons. *Basic Slag:* United Kingdom, 3,020 tons; Belgium, 2,786 tons; France, 80 tons; Germany, 100 tons; United States of America, 4,011 tons: total, 9,997 tons. *Bonedust:* Australia, 551 tons. *Guano:* New Caledonia, 159 tons. *Rock Phosphate:* Nauru Island, 6,036 tons; Ocean Island, 6,604 tons; Makatea Island, 4,300 tons: total, 16,940 tons. *Kainit:* Belgium, 130 tons; France, 520 tons; Germany, 962 tons: total, 1,612 tons. *Muriate of Potash:* United Kingdom, 10 tons; France, 10 tons; Germany, 25 tons: total, 45 tons. *Sulphate of Potash:* United Kingdom, 15 tons; France, 20 tons; Germany, 115 tons: total, 115 tons. *Potash, other:* Germany, 30 tons. *Sulphate of Iron:* Australia, 2 tons.

WERAROA-BRED FRIESIAN MAKES VICTORIAN RECORD.

In 1917 an exchange of pedigree dairy cattle was effected between the New Zealand Department of Agriculture and that of Victoria. Among other Friesians sent from the Central Development Farm, Weraroa, under this deal was the heifer Dominion Segis Fobes. Later she was disposed of by the Victorian Department to a Werribee farmer, Mr. G. A. Waite, by whom (on her second calf) she has been tested recently under the official Victorian system, in which the testing-period is nine months, and the records are taken in milk-yield stated in gallons. In the period 25th August to 24th May, 1921–22, Dominion Segis Fobes registered a production of 1,881·1 gallons, exceeding by over 500 gallons the previous Victorian record. At the conclusion of the test she was still milking well, the daily average for the last fourteen days being 49 lb. Dominion Segis Fobes descends from great producing families on both sides. Her dam, Jessie Fobes Beets, is still breeding at Weraroa. Her sire, Woodcrest Joe, is an outstanding Friesian who has left his mark on the Weraroa herd. Dominion Woodcrest Beets, one of the present herd sires at Weraroa, is full brother to Dominion Segis Fobes. (The photo reproduced at the head of this issue of the *Journal* shows some of the Friesians on the Central Development Farm.)

REGISTRATIONS UNDER THE FERTILIZERS ACT.

A number of storekeepers and others who sell fertilizers, or act as agents for firms of fertilizer-manufacturers, are apparently under the impression that it is not necessary for them to register as vendors under the Fertilizers Act so long as the fertilizers dealt with have been registered by the manufacturers. The Fertilizers Act requires that every person (or firm) selling fertilizers, either on his own account or as an agent, shall register his name and address annually, and shall deposit particulars of all fertilizers before offering them for sale. It is not sufficient, for example, to state that the vendor sells "A. B. and Co.'s mixtures." Full particulars of the fertilizers should be entered on the form of registration, supplies of which may be obtained from the Chemist, Department of Agriculture, Box 40, Wellington.

THE JOURNAL SUBSCRIPTION RATE.

As announced last month, it has been found necessary to raise the yearly subscription rate of the *Journal* from 4s. to 6s. The latter rate will apply to all new subscriptions as from 1st September, and to renewals which fall due in and after the month of August—that is, those commencing with the September or any subsequent issue. Concurrently, the ordinary charge for a single copy will be increased to 1s., and extra copies for subscribers to 6d. each. For the convenience of those who find it inconvenient to remit the small sum required for the initial subscription or the annual renewal, it has been decided that subscribers may, if they so desire, pay for a number of years in advance *at the reduced rate of £1 for four years' subscription.*

Hemp-grading Charges.—The provision in regulations under the Products Export Act that no charge should be made for the grading of export hemp when the price of this commodity fell below £25 f.o.b. at New Zealand ports has been revoked, and as from 1st August the grading-charge of 1d. per hundredweight will be made irrespective of market fluctuations.

New Rabbit District.—The constituting of the Umutoi Rabbit District (Pohangina County) under Part III of the Rabbit Nuisance Act, 1908, is gazetted.

Pedigree Live-stock for Sale.—The Moumahaki Experimental Farm, Waverley, has for private sale yearling Ayrshire and Guernsey bulls, also Berkshire boars and sows. Prices, &c., can be obtained from the Farm Manager.

Bees and Apiary Material.—A portion of the bees and apiary material for disposal at the Tauranga Horticultural Station is still unsold. Particulars were published in last month's *Journal.*